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ABSTRACT

This curriculum guide emphasizes that economics is a method of thought or analysis and highlights the teaching of macroeconomic concepts. Definitions of economics, economic actions and their results, individual and group relationships, and supply and demand principles are reviewed. Macroeconomic concepts that are introduced include: (1) economic catastrophes; (2) measuring economic aggregates; (3) economic interrelationships; (4) financial markets; (5) money; (6) banking; (7) business cycles; (8) income and expenditures; (9) the labor market; (10) economic synthesis; (11) feedback problems; and (12) the government and economic policy. Tables and charts are included. (JHP)

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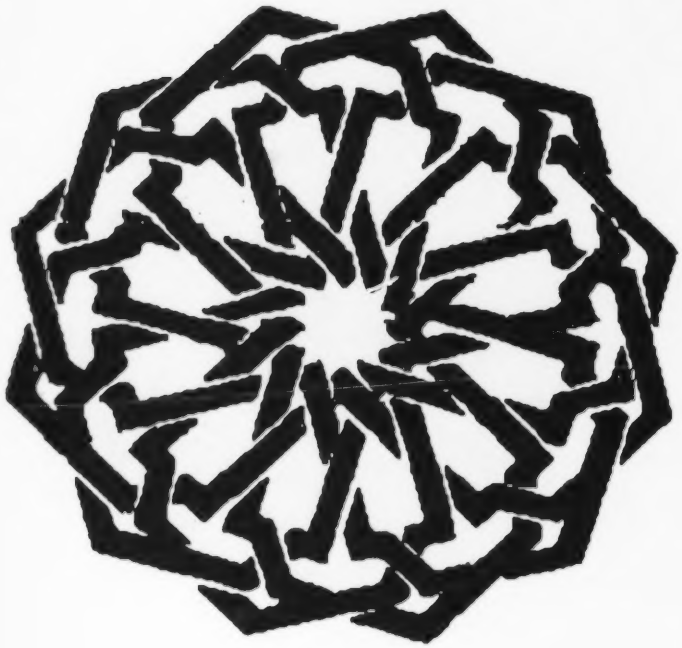
ECONOMICS

AN ANALYSIS OF UNINTENDED CONSEQUENCES



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VOLUME 2

INTRODUCTION TO MACROECONOMICS

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ROBERT E. SCHENK
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ECONOMICS:
AN ANALYSIS OF UNINTENDED CONSEQUENCES

VOLUME TWO

ROBERT E. SCHENK

ECONOMICS: ANANALYSIS OF UNINTENDED CONSEQUENCES

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TO THE STUDENT

Most students wonder why they should learn anything about the subject matter of the courses they take. They ask, "Will this course make me a better person, or will it help me in a career?" Economics encourages such questioning, for it proposes that people do (and often should) base decisions on the weighing of costs and benefits.

I have not seen any convincing arguments that economics will make you more moral or happier. I doubt if it improves your personality or your social skills. Some economists have suggested that it might make you a better citizen. After taking a course in economics, you should better understand the economic and political processes which shape the world you live in. But even if you have this understanding, there is no guarantee that you will use it for the public good. Knowledge is not goodness. However, economics does tend to form realists rather than idealists, and I suppose that one could argue that a world of realists is a better world than one of idealists.

Neither does economics teach you specific vocational skills which you will be able to apply is some future career. Economics is not like accounting or nursing, which do teach specific skills. Alas, if you want to work as a professional economists, graduate school is necessary.

Though people can live happy and fulfilled lives without economics, there are some things of value which a course in economics does offer the student. After you leave college, many of you will have careers in business or government. You will work in an environment shaped a great deal by economic forces and economic theories. If you master introductory economics, you will develop understandings and methods of thought which will help you cope with that environment.

This book emphasizes that economics is a method of thought or analysis. Many people have found the economic way of thinking very useful. It is used by a great many people who do not consider themselves economists. Lawyers, bankers, bureaucrats, corporate executives, in fact anyone who is in a position in which he or she must make a lot of decisions, can find the economic way of the economic way of thinking useful.

Another way of saying that economics is a method of analysis is to say that it is a technique of problem solving. It cannot solve all problems, but there is a large class of problems for which it is useful. The only way to learn to use a technique of problem solving is to practice it. Hence at the end of each chapter you will find a number of problems which attempt to make you apply the principles of the chapter. Some of them are fairly easy, some are quite difficult. I urge you to spend time and effort on all of them.

Also, notice that each chapter begins with a list of learning objectives. Look at them before you read the chapter, and again after you finish the chapter. You might also look at them in preparing for tests; they make a good study sheet.

TO THE INSTRUCTOR

There are scores of economics textbooks. The world would not seem to need another. Yet the continuing outpouring of new textbooks may indicate a widespread dissatisfaction with existing textbooks. It may also indicate that textbooks, at least introductory textbooks, are fun to write. This book would not have been written had I not been dissatisfied with the textbooks I have seen, and had I not enjoyed the challenge of trying to devise my own.

This book has a number of features which are uncommon in textbooks introducing macroeconomics. One of the most important is the emphasis given to the problems and questions at the end of each chapter. Some of them are meant to give students practice applying an idea from the chapter and others are included as a way of going a step beyond what is in the chapter. In some cases the student cannot understand important topics unless he or she works some of the problems. This use of problems is intentional. I believe that there is a high return on methods of learning in which students play active roles, and problem solving is one such activity. Learning economics is not a matter of memorization, but of discovering how to approach and solve problems.

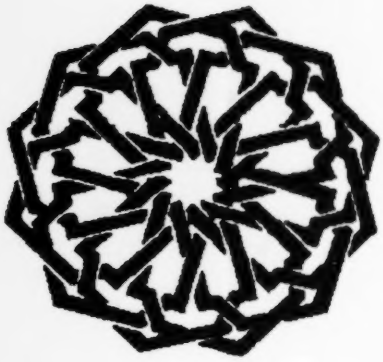
More than the problems, however, most instructors will notice the very different organizational structure of this book. There are a lot of economics textbooks, but they mostly have a very standardized structure. I hope the instructor will not judge this book by how close it is to the traditional structure, because if he or she does, this book will not fare well. Rather I hope the instructor will evaluate the book in terms of how well it flows logically, and in how well it introduces students to the central concerns of macroeconomics.

Most introductions to macroeconomics still work in a rather simple Keynesian framework which has been largely abandoned in the professional literature. Attempts to add some sort of aggregate supply or demand analysis to update the analysis often add more confusion than enlightenment. This text structures the macroeconomic discussion the way in which most economists think about the issues, in terms of a simplified general equilibrium approach. A general-equilibrium framework emphasizes that all markets are interconnected, and changes in one sector of the economy can have effects in other, seemingly unrelated sectors. This book uses an intuitive general-equilibrium framework which allows it to develop various macroeconomic points of view in a way that makes clear the assumptions, strengths, and weaknesses of each.

The traditional organization of the introductory course usually has macroeconomics precede microeconomics, though this seems to be slowly changing. Because logically it makes more sense to begin economics with its core, microeconomics, this is volume 2. However, it stands as an independent book and can be used first.

Principles textbooks tend to be a conservative force in most disciplines, that is, they tend to preserve ideas even after they have outlived their usefulness. If you are using this book, you obviously are willing to try new approaches. I hope you will enjoy the one I offer.

September, 1988



CHAPTER 1

WHAT IS ECONOMICS?

After you read this chapter and work the problems at the end, you should be able to:

Explain what the term "invisible hand" means and who first used it.
Give at least one common definition of economics.
State what Malthus thought about population growth.
Explain how Popper defines scientific statements.
Distinguish between positive and normative statements.
Explain what scarcity, choice, and self-interest have to do with economics.

Economics has been recognized as a special area of study for over a century. Virtually all four-year colleges have course in economics and most allow students to major in the subject. Economists maintain high profiles in governments, and they have been well represented among the highest appointees in the federal government of the United States. The press reports on their doings and sayings, sometimes with praise and admiration, sometimes with ridicule and scorn. Economics and economists are words that almost everyone has heard of and uses. But what exactly is economics? Very few people can give a good definition or description of what this field of study is all about.

DEFINING ECONOMICS

If the ordinary citizen cannot give a good definition or description of economics, he can be excused because economists have also had a hard time defining their field. This difficulty is a problem in all fields which have become complex with fuzzy boundaries and a variety of subdivisions that seem little related. In recent years, for example, economists have written papers and had them published by scholarly economic journals on topics such as sex, crime, slavery, childbearing,, and rats. It is not surprising then that one economist, in a lighter moment, suggested defining economics as "what economists do."

Defining economics as "what economists do" does not tell us anything we did not already know. A good definition must explain what it is that makes economics a distinct subject, different from physics or psychology. One should not expect to find a short definition that conveys with absolute clarity all there is to know about economics (or else there would be no reason to spend hours learning about it). Neither should one believe that there is only one correct definition possible. Many good definitions are possible, and each will focus on some important aspect of the subject. To use an analogy, there is not one spot from which one can best view Niagara Falls. Each viewpoint obscures some features and emphasizes others. There are of course some spots which are clearly superior to others, but people can disagree about which is the very best spot.

One of the earliest and most famous definitions of economics was that of Thomas Carlyle who in the early 19th century termed it the "dismal science." What Carlyle had noticed was the anti-utopian implications of economics. Many utopians, people who believe that a society of abundance without conflict is possible, believe that good results come from good motives and good motives lead to good results. Economists have always disputed this, and it was the forceful statement of this disagreement by early economists such as Thomas Malthus and David Ricardo which Carlyle reacted to.

Another early definition, one which is perhaps more useful, is that of English economist W. Stanley Jevons who, in the late 19th century, wrote that economics was "the mechanics of utility and self interest." One can think of economics as the social science which explores the results of people acting on the basis of self-interest. There is more to man than self-interest, and the other social sciences—such as psychology, sociology, anthropology, and political science—attempt to tell us about those other dimensions of man. As you read further into this book, you will see that the assumption of self-interest, that a person tries to do the best for himself with what he has, underlies virtually all of economic theory.

At the turn of the century, Alfred Marshall's *Principles of Economics* was the most influential textbook in economics. Marshall defined economics as "a study of mankind in the ordinary business of life; it examines that part of individual and social action which is most closely connected with the attainment and with the use of the material requisites of wellbeing. Thus it is on one side a study of wealth; and on the other, and more important side, a part of the study of man." Many other books of the period included in their definitions something about the "study of exchange and production." Definitions of this

sort emphasize that the topics with which economics is most closely identified concern those processes involved in meeting man's material needs. Economists today do not use these definitions because the boundaries of economics have expanded since Marshall. Economists do more than study exchange and production.

Most contemporary definitions of economics involve the notions of choice and scarcity. Perhaps the earliest of these is by Lionell Robbins in 1935: "Economics is a science which studies human behavior as a relationship between ends and scarce means which have alternative uses." Virtually all textbooks have definitions which are derived from this definition. Though the exact wording differs from author to author, the standard definition is something like this: "Economics is the social science which examines how people choose to use limited or scarce resources in attempting to satisfy their unlimited wants."

Scarcity means that people want more than is available. Scarcity limits us both as individuals and as a society. As individuals, limited income (and time and ability) keep us from doing and having all that we might like. As a society, limited resources (such as manpower, machinery, and natural resources) fix a maximum on the amount of goods and services which can be produced.

Scarcity requires choice. People must choose which of their desires they will satisfy and which they will leave unsatisfied. When we, either as individuals or as a society, choose more of something, scarcity forces us to take less of something else. Economics is sometimes called the study of scarcity because economic activity would not exist if scarcity did not force people to make choices.

When there is scarcity and choice, there are costs. The cost of any choice is the option or options which a person gives up. When you chose to read this book, perhaps you rejected the option of watching television. If you did, the cost of reading this book is the sacrifice of watching television. Most of economics is based on the simple idea that people make choices by comparing the benefits of option A with the benefits of option B (and all other options which are available) and choosing the one with the highest benefit. Alternatively, one can view the cost of choosing option A as the sacrifice involved in rejecting option B, and then say that one chooses option A when the benefits of A outweigh the costs of choosing A (which are the benefits one looses when one rejects option B.)

The widespread use of definitions emphasizing choice and scarcity shows that economists believe that these definitions focus on a central and basic part of the subject. This emphasis on choice represents a relatively recent insight into what economics is all about; the notion of choice is not stressed in older definitions of economics. Sometimes this insight yields rather clever definitions, as in James Buchanan's observation that an economist is one who disagrees with the statement that whatever is worth doing is worth doing well. What Buchanan is noting is that time is scarce because it is limited and there are many things one can do with one's time. If one wants to do all things well, one must devote considerable time to each, and thus must sacrifice other things one could do. Sometimes it is wise to choose to do somethings poorly so that one has more time for other things. (Question 2 at the end of the chapter asks you to illustrate this idea with an example.)

There is, however, an important aspect of economics which conventional definitions of economics ignore. Economists are not interested in examining every case of actions based on costs and benefits, but only on those in which there are some sort of unexpected or unintended consequences. When people live in systems so complex that they cannot fully understand them, they must make choices based on that part of the system which they do know about. These actions can have system-wide implications which are unintended or unexpected by persons making the decision. Economics starts with individuals making choices based on self-interest, but it is primarily interested in how these actions affect society as a whole. Do these choices lead to chaotic results, or to

harmonious ones?

When one looks at economics as a study concerned with unintended consequences of human choice and action, one sees that the results people get may not be those that they intend. As was noted above, economists argue that good results do not necessarily come from good intentions, and that good intentions do not necessarily lead to good results. This conclusion has often made economists controversial, and even today there are many who ignore this conclusion. For example, people who try to find a conspiracy behind all the world's problems, whether that conspiracy be of Communists, Jews, bankers, the CIA, or multinational oil companies, start with a belief that bad results must come from bad people with bad intentions.

UNINTENDED CONSEQUENCES AND ECONOMICS

As any other field of study, economics has had a history, and there are books that attempt to trace the trail of economic thought back to its origins. Though the trail can be traced back to the ancient Greeks, it is a difficult trail to follow prior to 1776. In 1776 Adam Smith published *The Wealth of Nations*, a book that is clearly about economics and which inspired a large number of books, pamphlets, and articles in the next 50 years. Before this book most ideas about economics were scattered in writings that were mostly about politics or ethics or philosophy, not in books that were clearly about economics. Yet if one looks at the topics and theories which modern economics textbooks contain and compares them to those things Smith discussed, one is struck by how little of contemporary economics comes directly from Smith. What does come from Smith is a concern about and an interest in unintended consequences.

The most famous term in the *Wealth of Nations* is the term"invisible hand." Smith used this term only once, in the following quotation:

> "...[B]y directing that industry in such a manner as its produce may be of the greatest value, he intends only his own gain, and he is in this, as in many other cases, led by an invisible hand to promote an end which was no part of his intention. Nor is it always the worse for the society that it was not part of it."

Another quotation makes clearer what the unintended consequences that the invisible hand leads to are:

> "Every individual is continually exerting himself to find out the most advantageous employment of whatever capital he can command. It is his own advantage, indeed, and not that of the society, which he has in view. But the study of his own advantage naturally, or rather necessarily leads him to prefer that employment which is most advantageous to society."

Smith was not sophisticated in the level of economic theory that he used. He did not understand concepts that are considered basic today, such as the model of supply and demand. (Alfred Marshall developed the modern treatment of supply and demand a century after Smith.) In his comprehensive survey of economic theory, Joseph Schumpeter dismisses Smith as a theorist, saying,

> "The fact is that the *Wealth of Nations* does not contain a single *analytic* idea, principle, or method that was entirely new in 1776."

Though the idea that there could be systematic unintended consequences was "in the air" at the end of the eighteenth century, no one articulated the idea as well as Smith. Because he expressed so well the idea that these unintended consequences are of vital importance for understanding how a society works, Smith has often been called "the father of economics."His book is concerned with a question that has interested economists for two hundred years: under what conditions will actions based on self-interest be beneficial to society. Much of economic theory has been developed and improved in an effort to get better answers to this ques-

tion.

The two most influential economists in the generation after Adam Smith were David Ricardo and Thomas Malthus. Though they disagreed about many things, they were in general agreement about the topic of population growth, and it was for his writings on this topic that Malthus is best known. Malthus believed that there was a tendency for human population to grow more rapidly than the food supply could be increased. Land was fixed in amount, and more food could be produced either by tilling it more intensively or by adding less-productive land to tillage. In either case an extra hour of labor brought less than an average return of food. The implication of these two different growth rates is clear—eventually a segment of the population will face starvation, and this will cut the growth rate of population.

Malthus' argument on population is pregnant with possible unintended consequences. Suppose that society aids its most needy members by giving them food. As a result, they can survive and reproduce. Helping the poor would, according to Malthus' argument, increase population and in the future lead to even larger numbers on the verge of starvation. Hence, charity would be self-defeating. All attempts to improve society seem doomed to failure according to a strict reading of the Malthusian argument, a truly "dismal" conclusion, as Carlyle noted.

However, Malthus and Ricardo were wrong when they applied this argument to human populations. The predictions they made did not occur. They underestimated both the ability of technology to improve crop yields and the future of birth rates. As it became apparent that they were wrong, economists lost their interest in the study of population. It seemed not to have the unintended consequences for them to explore. Since that time economists have occasionally developed other clever theories with intriguing possibilities of unintended consequences, only to find that they too were in conflict with real-world experience. The reader should bear this in mind as he learns what contemporary economists believe. There is a possibility that today's secure truth may be tomorrow's embarrassing mistake.

The theme that economics is concerned with unintended consequence also helps explain a boundary of economics. The past century has seen the development of the managerial corporation. It may seem surprising that prior to 1870 businesses were not seen as separate entities. A business was identified with its owner. When the owner died or retired, either the business died with him, or it was carried on by members of his family. Today this is no longer true. General Motors is an entity separate from any individual, and it will survive as long as its managers—all of whom can be replaced—are able to keep it alive. This managerial revolution took place at the end of the 19th and at the beginning of the 20th centuries.

What may at first glance seem remarkable is how little this revolution has affected economics. Most choices involving scarce resources and most production in our economy take place in organizations, either in large for-profit organizations or in large not-for-profit organizations. If one considers economics the study of choice or of production, one would expect major changes in economic theory as a result of the managerial revolution. However, it is difficult to find much change in economic theory that is due to the managerial revolution. One explanation of this situation is that economists have not been able to see important unintended consequences that flow from the change. In terms of unintended consequences that affect society at large, that is, the sort of effects that Adam Smith talked about, no one has shown that it makes much difference whether hired managers or legal owners run a firm. Because economics has neglected the large organization, other fields of study have developed to train the managers of these organizations, fields such as business administration, management, marketing, accounting, and finance. Though these fields borrow heavily from economic theory, they are distinct from economics.

On the other hand, even though bureaucratic governments are several thousand

years old, the recent growth of government bureaucracy in market economies has affected economics. Not only are there many unintended consequences which flow from government decisions, but government decisions often attempt to change the pattern of unintended consequences which markets produce. Economists are interested in the internal organization of the government and spend much more time studying the management of government than they do with the management of private organizations.

ECONOMICS AS A SCIENCE

Several of the definitions given earlier in this chapter said that economics is a science. Most economists will argue that economics is indeed a science. To examine this claim, it is necessary to begin by defining science.

Philosopher Karl Popper developed a definition of science which has been widely accepted. Popper said that a statement could be called scientific if it is open to the logical possibility of being found false. This definition means that we evaluate the accuracy of a scientific statements by testing it, by comparing it to the world about us. A statement is nonscientific if it takes no risk of being found false, that is, if there can be no way to test the statement against observable facts or events. Popper called this distinction the line of demarcation.

An implication of Popper's definition is that one can never be completely sure that any scientific theory is true. Accepted scientific theory is only theory that has not yet been contradicted by evidence, though the future may bring a contradiction. For example, we cannot be absolutely sure that the statement, "The sun will rise in the east tomorrow" is true because it is a scientific statement. We can easily think of a logical possibility which would refute it—a sun rise in the west. We have great confidence that such an event will not happen because the sun has always risen in the east. However, the fact that all previous experience has been consistent with the statement can never prove that the statement will never be refuted.

Popper saw the growth of scientific knowledge as a process of conjecture and refutation. Someone originally comes up with a way of explaining a set of facts, a conjecture or guess or theory about how the facts are related. If further observation is inconsistent with the theory, the theory is considered refuted and a new theory or conjecture must be found. (Note that if the original explanation is nonscientific, it will never be refuted and there will never be any need to change beliefs. See question 3.)

Most economists see their discipline as scientific in Popper's sense of the word. Economic theory makes statements about how facts fit together, and there are constantly new sets of facts arising that allow one to test the theory to see whether the facts are as theory predicts. However, this process is more difficult for economists than it is for physical scientists.

Unlike physical scientists, economists can almost never use controlled experiments to gather facts with which to test theories. Rather they must use whatever facts the world gives them and then use statistical procedures to try to draw conclusions. Though statistical procedures let economists hold some variables constant to see the effect of other variables, just as a controlled experiment does, they are subject to serious limitations. If there are variables that the theory says are important, but they cannot be measured or they can be measured only imperfectly, statistical procedures may give misleading results. Or the procedures may fail if the theory is uncertain exactly which of the many possible variables that may be involved must be controlled. A strength of a properly done controlled experiment is that there is no need to list all the factors which are controlled. The procedure is such that only one factor, or a small and known group of factors, is different between the control and experimental groups. Given these difficulties, it is not surprising that controversy about whether a theory is supported or re-

jected by the facts can last for many years in economics.

There is a minority of economists, however, who do not see economics as scientific in Popper's sense. The Austrian school, for example, has argued that economics starts with assumptions and that economic theory is the logically deduced results of those assumptions. If the theory does not fit the facts, one cannot conclude that the theory is wrong, but only that it is inappropriate to apply the theory in that particular situation because the initial conditions do not agree with the assumptions of the theory.

POSITIVE AND NORMATIVE STATEMENTS

Economists make a distinction between **positive** and **normative** that closely parallels Popper's line of demarcation, but which is far older. David Hume explained it well in 1739, and Machievelli used it two centuries earlier in 1515. A positive statement is a statement about *what is* and which contains no indication of approval or disapproval. Notice that a positive statement can be wrong. "The moon is made of green cheese" is incorrect, but it is a positive statement because it is a statement about what exists.

A normative statement expresses a judgement about whether a situation is desirable or undesirable. It expresses a judgement about *what ought to be*. "The world would be a more beautiful place if the moon were made of green cheese" is an example of a normative statement. Notice that there is no way of disproving this statement. If you disagree with it, you have no sure way of convincing someone who believes the statement that he is wrong.

Economists have found it useful to make this distinction because it allows people with very different views about what is desirable to communicate with each other. Libertarians and socialists, Christians and atheists may have very different ideas about what is desirable. When they disagree, they can try to learn if their disagreement stems from different normative views or from different positive views. If their disagreement is on normative grounds, they know that their disagreement lies outside the realm of economics, and economic theory and evidence will not bring them together. However, if their disagreement is on positive grounds, then further discussion, study, and testing may bring them closer together.

Economists can confine themselves to positive statements, but few are willing to do so because such confinement limits what they can say about issues of government policy. Both positive and normative statements must be combined to make a policy statement. One must make a judgement about what goals are desirable (the normative part), and one must decide on a way of attaining those goals (the positive part). Economists often see cases in which people propose courses of action which will never get them to their intended results. If economists limit themselves to evaluating whether or not proposed actions will achieve intended results, they confine themselves to positive analysis. (You should realize that though economists can speak with special authority on positive issues, even the best can be wrong.) However, most economists prefer a wider role in policy analysis, and include normative judgements as well. On normative issues economists cannot speak with special expertise. Put somewhat differently, addressing most normative issues ultimately depends on how one answers the question, "What is the meaning of life?" One does not study economics to answer this question.

Finally, note that most statements are not easily categorized as purely positive or purely normative. Rather they are like tips of an iceberg, with many invisible assumptions hiding below the surface. Suppose, for example, someone says, "The minimum wage is a bad law." Behind that simple statement are assumptions about how to judge whether a law is good or bad, or normative statements,

and also beliefs about what the actual effects of the minimum wage law are, or positive statements.

HOW TO APPROACH THE STUDY OF ECONOMICS

Agatha Christie wrote a series of mystery novels in which she challenged the reader to outwit her fictional heroine, Miss Jane Marple. By the end of the book the reader has the same facts which Miss Marple has. But the facts do not speak for themselves. Rather it is Miss Marple's ability to look at those facts in a special way, to see something significant where most readers see nothing, that lets her solve the mystery.

Facts in economics, as in an Agatha Christie novel, need to be organized in some way before they can tell one anything. By themselves they are meaningless. Thus, the study of economics involves more than a memorization of facts. Economics tries to organize facts with its theory. Good theory tells us which facts are important and which are not, and what is cause and what is effect. *The study of economics involves learning how to organize facts the way economists do.*

People who do not understand economics still try to make sense of the world around them by trying to see pattern in the facts they observe. Sometimes they use a simplistic "good-vs-bad" model. In a good-vs-bad model there are two conflicting groups who are classified as good people and bad people. These groups are usually involved in a *zero-sum game*: one person's gain is another's loss. Further, evil motives, possessed by the bad people, lead to bad results unless these people are in some way controlled. Good motives lead to good results.

An example of a good-vs-bad viewpoint was expressed at a town meeting of a small Indiana community during the Winter of 1977. The meeting focused on the natural-gas shortages which the community was facing. One citizen declared that the town faced not an energy problem, but a pricing problem. He noted that several years previously there had been shortages of gasoline at 40 cents a gallon but no shortages at 60 cents. Therefore, he declared, there must have been a conspiracy at that time by oil companies to increase prices as there was now by gas producers. The events he observed do fit into a good-vs-bad framework. He saw a bad result. He saw a bad motive—the desire for profit seems to many people the same as greed or avarice. To connect motive and result, he inferred the existence of a conspiracy.

Though a good-vs-bad model is sometimes appropriate (especially in small-group situations—see Chapter 3), economists are very reluctant to use it. The model of supply and demand developed in Chapters 4 and 6 gives a more sophisticated interpretation of the gasoline shortage, one which is depersonalized and unemotional with no bad groups involved. This model suggests that, in cases of shortages, one should search for government regulation of prices. The good-vs-bad model does not suggest that such regulation is something one should look for. In fact there were price restrictions in place at the time, and Chapter 6 explains why such restrictions could lead to shortages. The good-vs-bad view of the world is attractive because we are able to understand the model at a very young age and because we see the model used so often: in fairy tales, in comic books, in movies, and in television shows, among other places. Because we know how to use this model, and because our culture discourages use of alternative explanations such as fate or mystery, it is easy to fall back to this model if we do not have a more sophisticated model to explain our world.

Economic issues affect us all and most people have opinions about them. These opinions may be based on a good-vs-bad view, some other noneconomic framework, or simply slogans which are often repeated. Often the hardest problem students have in learning about how economists interpret the world is in unlearning their old, nonecon-

omic views.

A well-known example illustrates how hard it can be to unlearn old ways of thinking. In the late 15th century Christopher Columbus believed that by sailing a relatively short distance to the West, he could reach Asia. Contrary to popular myth, it was Columbus, not his critics, who had an outdated view of the world. He believed that the world was much smaller and that Asia was much larger than they actually are; his critics in their guesses were much closer to the truth.

Columbus made four trips to the Caribbean, but he never realized the significance of what he had found. He died believing that he had found a short-cut to the Far East. Rather than use the facts he had before him to alter and improve his ideas of world geography, he insisted on keeping his old views and trying to make the facts fit in.

Economic education involves learning to see reality from new perspectives. Sometimes these new perspectives may surprise you. They may even shock you. But if you take the time to look at the reasoning behind these economic ways of looking at things, you will find that they consist of carefully thought-out and applied common sense.

SUMMARY

This chapter introduced some key ideas of economics such as self-interest, choice, scarcity, and unintended consequences. It also examined the claim that economics is a science and introduced a distinction between positive and normative statements. Finally, it stressed that learning economics is not a matter of memorizing new facts but of learning to see facts in new ways.

QUESTIONS

1. One of the important choices which people make in life is what to do after they leave high school. List as many of the options that were available to you as you can. How many did you seriously consider?

2. What is something you have done that you did not do as well as you could have done? Explain why in terms of costs and benefits. (Comment: This question is *not* asking you to describe a mistake you once made.)

3. a)Which of the following are scientific statements according to Popper's definition? If a statement is scientific, explain what set of events would refute it.

Smoking a pack of cigarettes a day increases one's chance of lung cancer.
Two plus two equal four.
To be a good person, one must be a generous person.
God created the world in 4006 BC.
The Axis powers lost WWII because God was on the side of the Allies.
If the harvest is bad, food prices will rise.
The stars are distant suns.

b) In some societies all unexpected events are explained as manifestations of magic or the intervention of spirits. For example, it the harvest is bad, the gods are angry, and if the harvest is good, the gods ar happy. Explain why this way of interpreting events can persist indefinitely.

4. (a) At the end of the 17th century, England instituted a tax based on the number of windows a person had. Parliament wanted to force those who were wealthier to pay more, but did not have any way to enforce an income tax of the sort we have. At the time, however,

windows were a luxury item, so there was a high correlation between wealth and the number of windows a person had. Hence Parliament taxed windows. What unintended consequence resulted from this tax? (Hint: How could the wealthy avoid the tax?)

(b) Critics of drivers education programs claim that the programs do not reduce the number of accidents that teenagers are involved in. How could this program make teenagers safer drivers and yet increase accidents?

5. Which of the following statements are normative and which are positive?
New York city is on the Hudson River.
Washington D.C. is the capital of the United States.
Washington D.C. is a prettier city than is New York.
Washington D.C. has more people than New York.
When prices go up, people buy less.
When prices go up, poor people cannot buy as much.
High prices are unfair to the poor.

6. Write a statement that is clearly a positive statement. Write one that is clearly normative.

APPENDIX: A NOTE ON MATHEMATICS AND GRAPHS

As you proceed through this book, you will encounter many graphs and some mathematical equations. Economists use graphs and equations because they are quick and clear ways to express ideas. Very often a couple of graphs are worth a thousand words.

There are three sorts of ideas for which graphs and equations are especially well suited. The first is relationships. Examples or relationships from outside of economics are: the higher the altitude, the lower the boiling point of water; the further from the sun a planet lies, the slower its speed in its orbit; the saltier the water, the heavier it is. All of these relationships can be expressed more precisely in the form of graphs and equations than they can be in words. The same will be true of the economic relationships which you will meet in later chapters.

There are two kinds of relationships. If larger values of variable A cause larger values of variable B, the relationship is **direct**. For example, as income rises, people spend more. On the other hand, when larger values of variable A cause smaller values of variable B, the relationship is **inverse** or **indirect**. For example, when the price of apples rise, people will buy fewer.

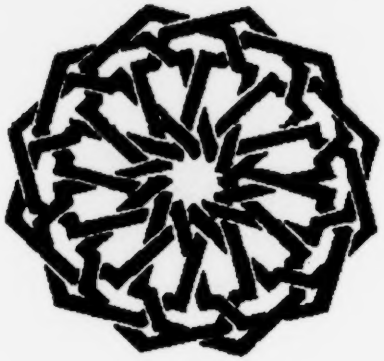
A second use of graphs and equations is to specify limits. As you now know, economic activity is grounded in the need of choice caused by scarcity. As a result, many economic relations can also be interpreted as limits. You will also see examples of this use of graphs as you read further.

A third use of graphs is to show how a series moves over time. If you look at the back of the *Wall Street Journal* or in the financial section of most large newspapers, you will see examples of this sort of graph.

If you have a good understanding of high school algebra, you will have no trouble at all with the level of mathematics used in this book. You will, for example, realize that algebraic equations can be illustrated graphically and that graphs can be represented algebraically. (Because they are visual and easier for the beginner to grasp, this book relies more heavily on graphs than equations.) If you do not have a good mathematical background, take heart. First, most ideas that yield graphs are first explained verbally and then in tables. And second, the course will give you an opportunity to practice and learn some of the basic mathematics which you should have learned in high school.

QUESTION

1. Illustrate what each of the three relationships mentioned (altitude-boiling point, etc.) above look like. Which are direct and which are inverse relationships?



CHAPTER 2

ACTIONS AND RESULTS

After you read this chapter and work the problems at the end, you should be able to:

Define the following terms: multiplier effect, equilibrium condition, adjustment process, production-possibilities frontier, and budget constraint.

Explain what an identity is and give examples.

Distinguish between an unstable and a stable equilibrium.

Explain why the system of market exchange can be considered as a system of constrained behavior.

Explain the logic behind the problem of the commons.

If given a simple model of contingent behavior in the form of Table 2, be able to determine positions of equilibrium.

People's actions can have surprising results. If they did not, there would be little for economists to study. This chapter considers some situations in which unexpected results can come from interactions of people's actions. In the process of looking at these situations, it introduces you to a number of concepts which are fundamental to the economic way of thinking. The chapter begins by looking at cases in which matching problems constrain the system so that certain results occur regardless of how people behave. It continues by looking at contingent behavior, or situations in which the behavior of each person depends on the expected behavior of others. It then looks at situations in which constraints force people to a result they do not necessarily want in their efforts to get something that they do want. It closes by looking at situations in which an unintended result is a side-effect of other actions.

MUSICAL CHAIRS

In September of 1982, railroad engineers across the United States went on strike for several days until the President signed a bill ordering them back to work. The strike created transportation difficulties in several major cities, including Chicago, as suburbanites who normally rode the train tried to find alternative ways to get to work. Many found that highway congestion was not as serious a problem as was parking-lot congestion. When they finally got downtown there were no parking spaces left. After reporting the problem, one television newscaster in Chicago advised all commuters to start driving earlier the next day so they would find a spot to park.

If all commuters had followed this advice, the situation would have been worse rather than better. The parking lots would have filled up earlier and there would have been the same number of people who would have been unsuccessful in finding spots. Everyone would have wasted time by starting earlier. The situation here is not unlike the proverbial fire in the theater. If everyone calmly walks to the exits, the theater will be emptied as fast as, if not faster than, if everyone runs to the exits. What may be a solution for one is not a solution for all if everyone tries it.

As another example of a matching problem, consider this excerpt from a letter which many thousands of people have received:

> "You too will be making easy money in three to four weeks....My method is simple. I sell thousands of people a product for $5.00 that costs me pennies to produce and mail. Everyone involved in the program makes money from everyone else in the program. If anyone makes money, everyone makes money....This plan has the effect and appeal of a chain letter, but it is legal since you are offering a legitimate product to your people."

The product being sold is a copy of instructions which the buyer then can sell to others.

Is it possible for everyone involved to make money from this scheme? To see that it is not, you must first realize that since the "product" being sold is worthless, the scheme is simply a way of redistributing money. It works with the same logic as a chain letter. All the money that people make in the scheme must come from others involved in the scheme. The sum of money received must equal the sum of money sent. The redistribution is the same as that which takes place in a poker game: the sum of winnings must equal the sum of losings. If anyone involved in the game ends up with *more* than he started with, someone else must end up with *less*.

In matching problems there is no need for any assumptions of how people act; the results are determined regardless of how people behave. Economists do use matching formulas, but never alone as a complete theory. Economic theories always contain assumptions about how people act. But within the theories, matching formulas in the form of **identities** can play important roles. An identity is a statement true by definition. An example of an identity is the statement, "The amount bought must equal the amount sold." Since whatever is bought must have been

sold and vice versa, this statement must always be true. Another example of an identity is the statement, "Net worth equals assets minus liabilities." This statement underlies the balance sheet, a basic tool of accounting.

CONTINGENT BEHAVIOR

Contingent behavior exists when each person's actions depend on what he expects others to do. Its role is obvious in our day-to-day behavior. The way a person going to a party dresses will depend on how he expects others to dress. People select the time and place they eat lunch on expectations of when and where others will eat. The route a person takes to work depends on what routes he expects others to use. Students decide whether or not to cut a class before a vacation based on how many other students they expect to cut the class, and the amount they study for a test is often based on how much they expect other people to study.

The existence of unintended consequences in contingent behavior can be illustrated using Figures 1 and 2. In both pictures the behavior of the people involved depends on how they see others acting. You should be able to see that in Figure 1 the end result will be that two people will remain standing. Figure 2 differs from Figure 1 in that one person's instructions have been changed. But in Figure 2 the end result is that all five people remain standing.

There is a **multiplier effect** in these pictures that is the source of the unintended consequence. Changing the instructions of one person changes the behavior of three. When one person changes behavior, it may cause still another to act differently, which in turn can cause still another to act differently. Thus a small initial change may result in a large final change. The result can be unintended because people act ignoring the effect that their behavior will have on the behavior of others.

We could drop the topic of contingent behavior at this point, noting that though it seems commonplace in our day-to-day activity (is it not what peer pressure is all about?), economists have not spent much time with it. However, developing the topic a bit further, by being more specific about the basic model involved in contingent behavior, introduces some ideas that are essential to understanding economic theory. The advantage of meeting them here is that, as with most ideas, they will be easier to understand when you see them in a variety of contexts.

To illustrate the model, suppose there are ten men who make a choice each morning on whether or not to wear a tie to work. Their behavior depends only on how they expect others to act, and this behavior is presented in Table 1.

TABLE 1

CONTINGENT BEHAVIOR

PERSON		
A		1 other doing so
B	will wear	5 others doing so
C	a tie if	5 others doing so
D	he sees at	2 others doing so
E	least	7 others doing so
F		6 others doing so
G		6 others doing so
H		3 others doing so
I		3 others doing so
J		5 others doing so

Based on this information, how many workers will wear ties? To begin answering this, we need to specify an **equilibrium condition**. An equilibrium exists when the system is at rest and has no further tendency to change. The logical equilibrium condition in this model is that there will be no further changes in behavior when expected behavior is the same as actual behavior. When actual behavior is different from expected behavior, we expect some adjustments to be made so the system will not be at rest. To determine

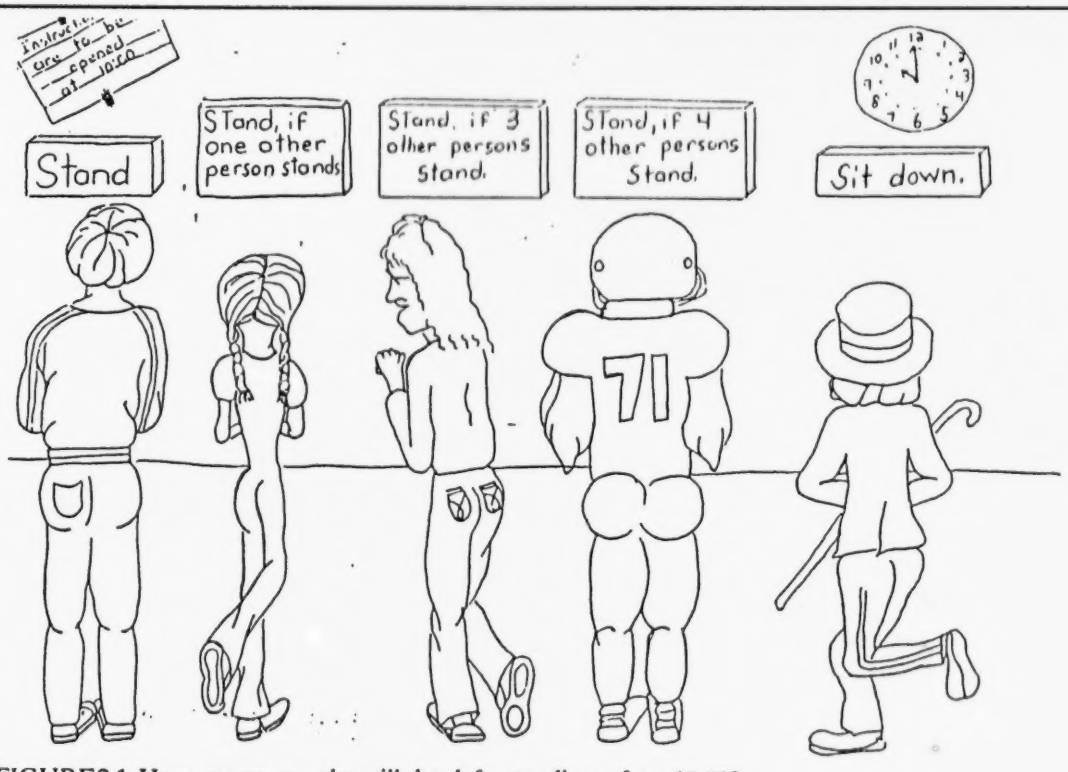

Instructions are to be opened at 10:00
Stand
Stand, if one other person stands
Stand, if 3 other persons Stand.
Stand, if 4 other persons Stand.
Sit down.
71

FIGURE2.1 How many people will be left standing after 10:00?

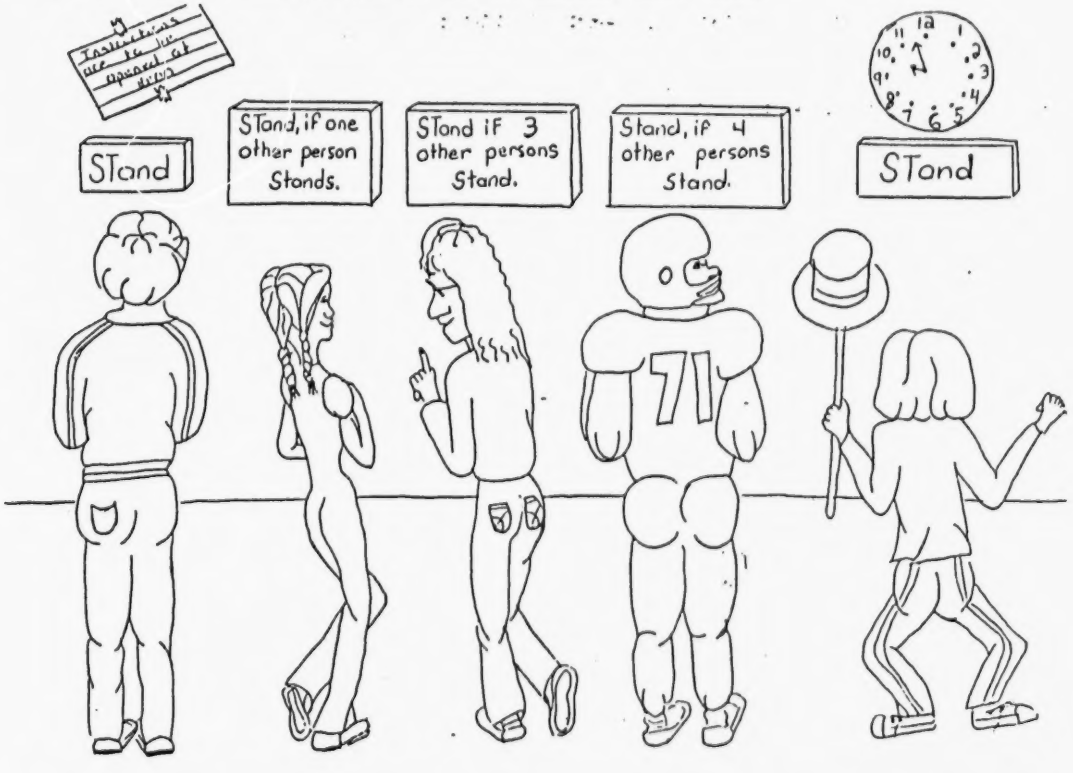

Instructions are to be opened at 10:00
Stand
Stand, if one other person Stands.
Stand if 3 other persons Stand.
Stand, if 4 other persons Stand.
Stand
71

FIGURE2.2 How many people will be left standing after 10:00? You should see the multiplier concept at work here. Explain how it works in this case.

where the system will be in equilibrium, the information in Table 1 can be reorganized to yield Table 2. Table 2 says that if no one is expected to wear a tie, no one will. If one other person is expected to wear a tie, one person (A) will. If at least 5 others are expected to wear a tie, everyone except E, F, and G, or seven people, will wear ties.

By trying various possibilities, one will discover that there are three positions of equilibrium: no one wearing ties, everyone wearing ties, and four people wearing ties. This is done in the third and fourth columns of Table 2. Thus, if five other people are expected to wear a tie, seven in fact will. All the people who wore ties will be satisfied, because at least five other people were wearing a tie. But persons F and G will not be happy. They will observe that seven other people are wearing ties, and will change their expectations and thus their behavior.

This model has several parts. One part, given in Table 1, is a statement or assumption about how people act. As in most economic theories, this model makes assumptions about how *individuals* act, but is interested in group results. A second part of the model is a condition of equilibrium. Implicit in our discussion above is a third part, an **adjustment process.** An adjustment process explains how a system moves from a position of disequilibrium to one of equilibrium. An important part of the adjustment process in this model would be statements of how expectations were formed. The simplest would be that people expect others to continue acting as they did the day before. You can act out what happens with this assumption. If ten students are given cards with instructions similar to those in Table 1 (instead of wearing ties, the instructions might say, "Raise your hand." or "Sit down."), a class can experiment with various starting points and see what happens.

If four people wear ties, the system will be in equilibrium, but the equilibrium will be **unstable**. This means that any small divergence away from equilibrium will take the system increasingly far from it. If the system begins with an equilibrium of four, and A forgets his tie one day, the system will move to zero. If E wears a tie for a special reason, the system will move to ten. In contrast, zero and ten are **stable** equilibria. (The plural of equilibrium is equilibria. The word thus betrays its Latin origin.) A small divergence from either will tend to disappear. Figure 3 illustrates an unstable equilibrium. An egg balanced on its end is at rest with no tendency to move. Hence, it is in equilibrium. But if anything disturbs it, it will not return to this original position. Filling the bottom of the egg with plaster would make this equilibrium stable. Then any disturbance would rock the egg, but it would return to its original position.

Models of contingent behavior can be more complex than that illustrated in Table 2.

TABLE 2 CONTINGENT BEHAVIOR REVISED

OTHERS EXPECTED	NUMBER ACTING	WEARERS OK?	NON-WEARERS OK?
0	0	—	YES
1	1	NO	YES
2	2	NO	YES
3	4	YES	YES
4	4	NO	YES
5	7	YES	NO
6	9	YES	NO
7	10	YES	—
8	10	YES	—
9	10	YES	—

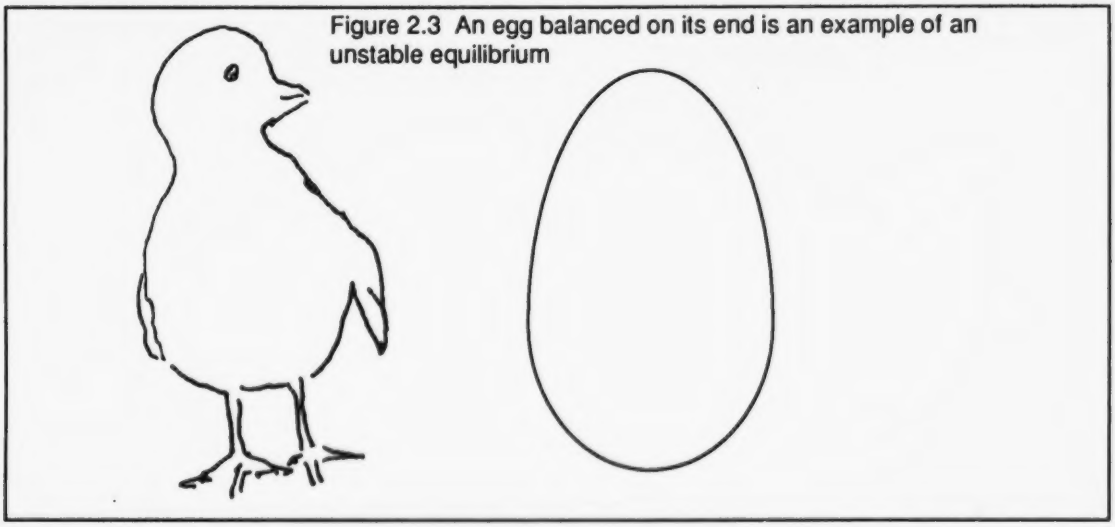


Figure 2.3 An egg balanced on its end is an example of an unstable equilibrium

What if, for example, not everyone has the same initial expectations or if they adjust to new expectations in a variety of ways? Further, the model may not be good for situations involving small groups, such as we used for illustration. In a small group people will not only respond to and form expectations on the basis of observed behavior, but they also will rely on verbal conversations among group members.

There are a number of economic situations that contingent behavior may help explain. The prices of fine art, stamps, rare coins and other collectables seem in large part determined by what people expect others to be willing to pay. People are willing to spend $5000 or more (and often much more) for a postage stamp because they are confident that they can resell it at the same price or a price close to it. Contingent behavior also may explain the wide price fluctuations in some speculative markets, such as that for gold. It even explains why people consider paper money valuable. Everyone is confident that others will accept it.

However, economists have not spent much effort exploring contingent behavior with one exception. The one exception involves the Keynesian theory of national income, which was for many years the primary way economists thought about how unemployment and GNP were determined. In this theory people's spending depends on what they expect their income to be, and income in turn is the same as spending (because whatever one person spends, another receives as income). Equilibrium in this model exists when people receive the income they expect—otherwise they change expectations and behavior. There is also a multiplier effect in this model. When one person changes his behavior, it affects others, who change their behavior in turn. (Chapter 12 develops this model.)

CONSTRAINED BEHAVIOR

A probable reason economists ignore models of contingent behavior is that these models do not clearly present the favorite assumption of economists, that individuals base their actions on the costs and benefits which they see. The importance of benefits in determining behavior implies that people have goals, for without goals, one cannot talk about benefits of a decision. Costs exist whenever there is scarcity and choice. Cost is whatever options must be given up in making a choice. Often cost is in the form of money, but it can take other forms as well. The cost

of going to college, for example, includes not only the money a person spends on tuition, (which could be spent on something else) but also includes the time spent studying and going to classes. The value of this time can be estimated by computing the amount of income a person could have earned if he did not go to college.

Scarcity is at the basis of many economic concepts because it constrains or limits our behavior. Let us explore the notion of constrained behavior by starting with the simplest sort of economic structure, Robinson Crusoe alone on his island.

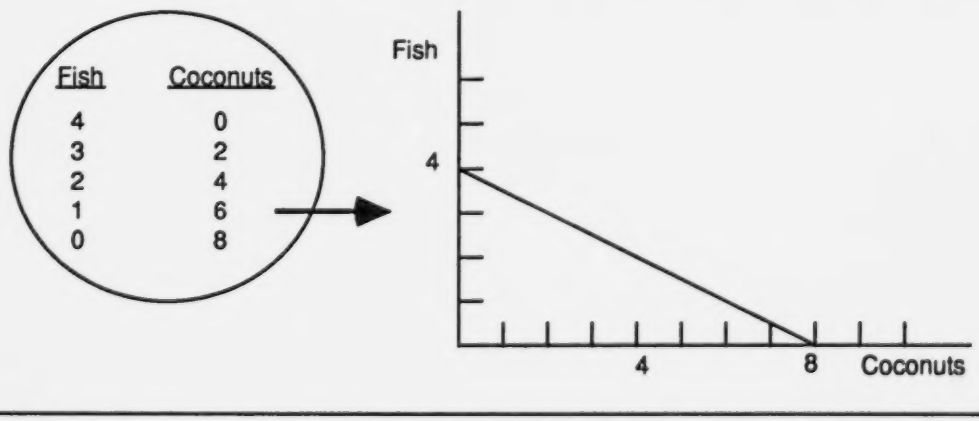
Suppose that each day Crusoe has enough time to catch four fish or to gather eight coconuts. Notice that he cannot have both four fish and eight coconuts. If he uses his time to catch fish, he does not have that time to find coconuts. If he wants both coconuts and fish, he can devote some time to both. If, for example, he spends half the day fishing and the other half gathering coconuts, he can have two fish and four coconuts.

A list of all the possible combinations of fish and coconuts open to Crusoe makes up his **production-possibilities frontier**. The production-possibilities frontier separates outcomes which are possible for an individual (or a group) to produce from those which cannot be produced. Because Crusoe cannot exchange, his production-possibilities frontier is also his **consumption-possibilities frontier**. The consumption-possibilities frontier, which later chapters will also call a **budget constraint**, is the line indicating which outcomes are affordable and which are not affordable. Figure 4 illustrates Crusoe's production-possibilities frontier (and his consumption-possibilities frontier).

The slope of the frontier in Figure 4 indicates the costs facing Crusoe. In order to get an extra fish, he must sacrifice two coconuts, and to get another coconut, he must sacrifice one half a fish. Notice that there is no money involved; cost does not depend on money. In economics the cost of anything refers to whatever is given up in order to get that thing.

Now suppose that civilization arrives in the form of the Friday Trading Post. The trading post trades one fish for one coconut (or one coconut for one fish). Will the existence of the trading post make life better for Crusoe? It will if it gives him more consumption possibilities than his production-possibilities frontier allows him. To see that it does, consider what will happen if Crusoe collects eight coconuts, and trades them for fish. He will be able to get eight fish, which is not a possibility that his original budget constraint allowed him. Figure 5 shows the consumption-possibilities frontier which exchange opens up to him.

Figure 2.4 Crusoe's Production-Possibilities Frontier



Suppose that before trade, Crusoe was at point a on his production-possibilities frontier in Figure 5, and that once trade is possible, he wants to be at point b. In order to get to b, he must devote all his time to gathering coconuts. Some of those coconuts he will want, but others he gathers only to trade. In order to get to where he wants to be, Crusoe must do something he does not want to do. He must work gathering coconuts.

Exchange, then, requires a person to give in order to get. It makes people do things which they do not want to do in order to accomplish their goals. Adam Smith wrote about constrained behavior in this way:

> "It is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinners but from their regard to their own interest. We address ourselves not to their humanity but to their self love, and never talk to them of our own necessities but of their advantages."

The butcher and baker want to profit from their businesses so that they can obtain material goods for their own use. In the pursuit of this goal, they provide a product to the consumer. If one of these merchants refused to provide a quality product at a reasonable price, consumers could take their money elsewhere. The existence of other sellers provides a limit on each merchant. However, they can at times find ways to "beat the system." They can stop competing and monopolize, charging consumers more in the process. Or they can sell defective merchandise to consumers who think that they are buying quality merchandise.

The system of market exchange is the most studied system of constrained behavior with which we live. There are, however, many other such systems around us. Politicians would be less sensitive to people's desires if they did not have to endure elections. Mothers and fathers who tell their children that they will not get dessert if they do not finish their meal are using this system, as are grade school teachers who tell their students that they will get no recess if they are not quiet. Finally, college students deal with an interesting system of constraint called the "grading system" in their struggle to earn a college degree.

Let us consider how the grading system works under some extreme assumptions. Assume that students want to obtain a college degree but are totally uninterested in learning anything in the process of obtaining that degree. Assume also that the faculty has a goal of increasing student knowledge, and does not care at all whether or not the student does graduate.

The faculty can achieve its goals with the

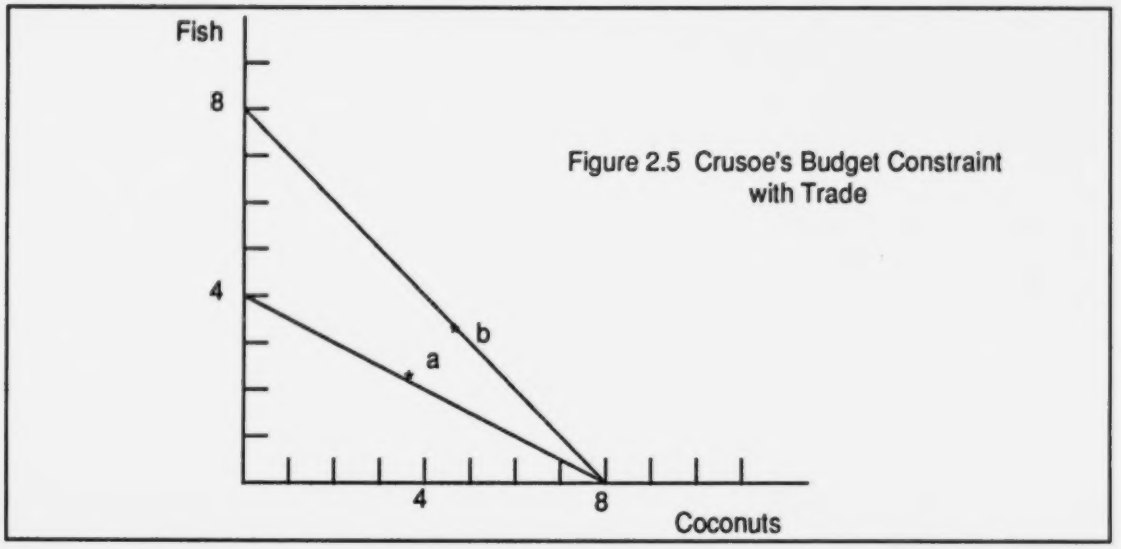


Figure 2.5 Crusoe's Budget Constraint with Trade

system of tests and grades that is familiar to all college students. This system forces students to learn what the faculty members desire in order to obtain a degree. Whether students are fascinated with what they learn or have no interest in it at all does not matter in this system. In either case, learning must take place.

Or must it? College students have long known that there is in fact a way to "beat the system," that is, one can achieve the goal without performing as the system requires. Students can cheat. When they cheat, students still achieve their goals, but they no longer do those things which they do not want to do. All systems of constrained behavior have ways of "cheating" on the system, and if cheating is too easy, the system will not work well.

If one views college education as a struggle to learn, with grades and degrees as unimportant by-products, cheating should never happen. The fact that cheating does occur in colleges suggests that there is a large element of constrained behavior in college education.

Sometimes systems of constrained behavior have been consciously designed, but often they have grown up spontaneously, as did the market system. Whether spontaneous or designed, people often try to change how systems work. When a system of constrained behavior is complex, and those making the changes do not fully understand the system, the results of the changes in behavior can seem surprising and unexpected to those making the changes. For example, consider the grading system. If the faculty believed students are motivated only by a love of learning, it might decide to abolish grades. It would be surprised when the amount of learning falls. When one wants to alter a system of constrained behavior, it is necessary to understand the system. This necessity provides the major demand for economists. Governments often want or need to change incentives in markets, and they often ask economists for predictions about the effects of those changes. And even when they do not ask, economists give answers. A great deal of their scholarly work is concerned with how the system of market exchange works, and what the effects of various changes will be. You will see many examples of economists concern for the effects of such changes in the chapters ahead. In some of these examples you will see how useful economists find the simple concepts of budget constraint and production-possibilities frontier.

BY-PRODUCTS OR SIDE-EFFECTS

Sometimes when a person tries to achieve his goals, side-effects occur which affect others whom the person making the decisions either does not know about or does not care enough about to let them influence his decisions. Economists have found a number of situations which are based on such side-effects. An obvious example of by-products is the production of pollution. However, by-products may be helpful or neutral to others as well as harmful.

Pollution is not an intended product, but it is one output in a production (or consumption) process. Consider, for example, the production of electricity from coal. Among the outputs of this production process are electricity, heat, carbon dioxide, and ash. The type of coal used will influence the outputs—some coal is high in sulfur, which will emerge in some form as an output. The electricity is the desired output, and the others are unwanted outputs that cannot be totally avoided. If one of the outputs is considered undesirable, it can sometimes be controlled, but this process will create other by-products.

Pollution is a word that refers to by-products that are considered undesirable to others. If no one considers the waste heat that is a by-product of the production of electricity a problem, that waste heat will not be called pollution. When it is considered a problem, the government may force the electric utility to use resources to deal with it, by building

cooling towers, for example. A cooling tower does not, of course, reduce the total waste heat. It only transfers some of it from the water to the air where it is considered less undesirable.

One of the most important topics in the class of by-products is the creation of money. Money in modern economies arises as an unintended results of banks in the process of making loans. This aspect of banking is important to economists because they have evidence that changes in the amount of money influences the amount of inflation and unemployment which a society has.

An equally important case of actions with a by-product is one which has become known as the **problem of the commons**. The commons exist whenever there is a resource, such as grazing land, a hunting area, or a fishing grounds, which is open to all. The problem of the commons refers to the absence of any automatic mechanism or incentive to prevent the overuse and depletion of the commonly-held resource.

To see why this overuse can happen, consider a common grazing area. Suppose Table 3 shows the relationship between the number of cows using the land and the amount of milk that can be produced. (We shall ignore all other outputs, such as meat, leather, and fuel. The technical name for a table such as Table 3 which shows output depending on inputs is "production function.")

If one person controlled access to this land, it would be foolish for him to allow more than 400 cows to graze there. But when the land is open to all, 500 cows may end up grazing if each of the many herders tries to do what is best for himself. Thus, if there are 100 herders, each with four cows, each cow will produce 7 gallons of milk. If one herder adds an extra cow, the total production of milk does not increase, *but the production from his herd will.* He will have five cows, each producing 6.98 gallons (ignoring all digits beyond the second to the right of the decimal point). The fifth cow adds 6.98 gallons of milk. However, each of the four cows he already has will produce .02 gallons less, so the net gain to the herder will be 6.9 gallons.

TABLE 3
PRODUCTION ON THE COMMONS

# OF COWS	OUTPUT OF MILK
100	1000 GAL
200	2000
300	2600
399	2799
400	2800
401	2800
500	2700
600	2600

He will not take into consideration the drop in production of .02 gallons from each of the 396 cows that he does not own. Since each herder has the same set of incentives, it may easily happen that there will be 500 cows grazing on the land. Clearly there is an unintended consequence here, and it is of the by-product type. Each herder ignores the effects that his cows have on the productivity of cows he does not own.

The logic of the problem of the commons is behind many ecological problems, from deforestation to depletion of the ozone layer. In a sense the core of the problem is that behavior is unconstrained in any way. The next chapter will describe two basic methods that restrictions can be placed on people's actions in order to give better results.

SUMMARY

In exploring some of the reasons for unintended or unexpected consequences, this chapter introduced you to a number of important concepts and ideas which you will need to know as you read further. You met concepts of identity, model, behavioral statement, equilibrium condition, stable and unstable equilibria, adjustment process, budget constraint, and production-possibilities frontier. You also met the assumption that people act on the basis of cost and benefits, an

assumption which you will see throughout the book. Finally, you saw examples of constrained behavior, by-products, and the problem of the commons.

QUESTIONS

1. "In Ithaca, New York, where I live, the cable TV system carries most New York Yankee baseball games. One August night, sportscasters Phil Rizzuto and Bobby Murcer were calling a slow game between the Yankees and the Milwaukee Brewers. Between pitches, Rizzuto was looking over his record sheets and remarked that the Brewers had done much better in day games than in games played at night. Murcer checked his own records and found that the Yankees, too, had a much higher winning percentage during the day. With characteristic enthusiasm, Rizzuto then conjectured that all teams have better records for day games. In a brisk exchange of the sort that makes summer evenings in Ithaca seem to fly by, the two then spent the rest of the inning discussing the poor lighting conditions in American League parks and various other difficulties that might help account for why teams do so poorly at night."

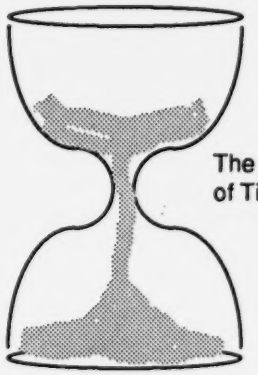
(From Robert H. Frank, *Choosing the Right Pond: Human Behavior and the Quest for Status* (New York: Oxford University Press, 1985), p. 3.)

There is something terribly wrong in the discussion described in the previous paragraph. What is it and why is it wrong?

2. Replace the numbers in Table 1 with the numbers below. What will the equilibrium (or equilibria) be? Is it (are they) stable?

A will wear a tie if at least 7 others do.
B will wear a tie if at least 9 others do.
C will always wear a tie.
D will never wear a tie.
E will wear a tie if at least 6 others do.
F will wear a tie if at least 3 others do.
G will wear a tie if at least 5 others do.
H will wear a tie if at least 2 others do.
I will always wear a tie
J will never wear a tie.

3. When is the hourglass at the right at equilibrium? Is equilibrium always a good thing? Explain.



The Sands of Time

4. Suppose that a cure for all cancer is discovered. Why will this increase the percentage of people who die from heart disease? What idea in this chapter does this possibility illustrate?

5. Which would an economist expect to be more likely to reduce cheating: repeatedly telling students that cheating harms other students and is immoral behavior, or increasing efforts to detect cheating and increasing the penalties?

6. a) Using Table 1 in the chapter, suppose that initially persons E, F, and G are wearing ties. What will the equilibrium be? Describe the steps in which the system reaches equilibrium.

b) Suppose that initially people B, C, G, F, and J are wearing ties. Describe the adjustment process.

c) Suppose person E has the instructions, "Always wear a tie." What will this change do the positions of equilibrium?

7. Which salesman would you expect to be more likely to cheat his customers: a door-to-door salesman, or a salesman from a large steel company selling to a major automobile manufacturer? Explain your answer in terms of the costs and benefits of cheating.

8. Suppose that Crusoe and Friday live together on an isolated island. Each day Crusoe can either catch four fish or gather eight coconuts, and Friday can either catch six fish or gather 3 coconuts. Compute the production outcomes of this economy in the table below, and then explain which one of the four possibilities will not be on the production-possibilities frontier.

	total coconuts	total fish
Both fish		
Friday fishes, Crusoe gathers		
Crusoe fishes, Friday gathers		
Both gather		

9. The Dukedom of Scimonoce (it is a backward economy, hence its name) is a totally agricultural economy that grows only corn and/or oats. There is no trade with neighboring countries, and there are only five small plots of farmland that produce as follows:

Plot	either Corn	or Oats
A	50	10
B	40	10
C	30	10
D	20	10
E	10	10

a) If the country decides that it wants 30 units of oats produced, what is the largest amount of corn that can be produced? _____ Which plots do you plant in oats to get this result, and which do you plant in corn?

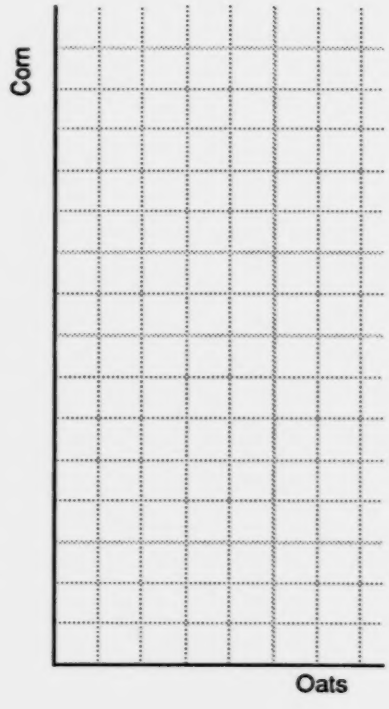
In Corn _____

In Oats_____

b) Given your answer in part (a), what is the opportunity cost of 10 more units of oats (increasing oat production from 30 to 40)?_____

c) Finish filling in the production possibilities table below and plot the points on the graph.

CORN	OATS	Plots Used for Corn	Plots Used for Oats
150	0	A, B, C, D, E	None
140	10		



d) Where is the point 30 oats and 30 corn on the graph? (Label it X.) Is it possible to produce 30 units of corn and 30 units of oats? If you answer that 30 corn and 30 oats is attainable, explain how you get it, that is, where do you plant oats and where do you plant corn.

e) Is the production of 30 corn and 30 oats efficient?

f) Where is the point 40 oats and 60 corn on the graph? (Label it Y.) Is it possible to produce 40 oats and 60 corn? If you answer that 40 oats and 60 corn is attainable, explain your planting decision that makes it possible.

g) Will the dukedom produce up to its potential if plot A is left empty? What will happen to the production-*possibilities* frontier?

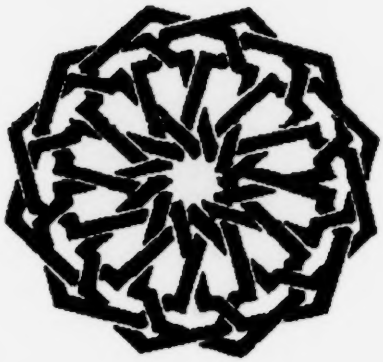
h) Suppose consumers decide that they want 1000 units of corn and 300 units of oats. Will anything happen to the production-possibilities frontier? Explain.

i) Suppose the owner of plot E finds a method to increase his (and only his) oat production to 20. Recompute the production-possibilities table and draw the new curve on the graph above.

j) From the information given, can one tell which combination of oats and corn the dukedom should produce? Explain.

10. "I had long been puzzled by the behavior of the whaling industry.... [W]hales, which could provide a permanent resource if harvested prudently, were overexploited and driven toward extinction. This mysteriously "self-destructive" behavior of the industry was explained to me by a Japanese economist. Like most conservationists, I had assumed the industry's goals would be to maximize the sustainable annual yield of whales. In fact the industry has been trying to maximize the present value of the whale resource. If various species of whales are driven to extinction... the capital can be turned to the rape of another (in the minds of economists) array of available resources. Such behavior [is] perfectly rational in the dominant economic paradigm...." (From Paul Erlich, "Environmental Disruption: Implications for the Social Sciences," *Social Science*

Quarterly, March 1981, p 10.) From what you have learned in this chapter, do you think Erlich (or the unnamed Japanese economist) understands the usual view of economists about why whales are threatened with extinction? Explain. (Hint: Does the whaling industry have goals, or do individual whalers have goals?)



CHAPTER 3

THE INDIVIDUAL AND THE GROUP

After you read this chapter and work the problems at the end, you should be able to:

Explain the logic of the prisoners' dilemma.

Explain how Hobbes differed from Smith in his predictions of the results of actions based on self-interest.

Explain why the assumptions and methods of economics do not allow it to examine the inner workings of families or other small groups who know each other well, but do allow it to examine exchange and politics.

Distinguish between restricted and generalized altruism, and explain why economists can live with the first but not the second.

List the two basic ways in which self-interested decisions can be coordinated for the good of the group.

Economic theory is based on the assumption that individuals pursue their self-interest. Each person makes decisions based on the costs and benefits which that person perceives. The last chapter showed that the pursuit of an individual's goals could affect the group in ways which the individuals could not foresee.

This chapter explores the topics of self-interest, group interest, and the relationship between them. It uses the prisoner's dilemma, which is an example of a technique called *game theory*, to illustrate possible relationships between the individual and the group. Game theory is an analysis of interactions where the outcome a person faces depends not only on his strategy of action, but also on the strategies of others. Since its development in the 1940s, game theory has found important uses in many fields, such as economics, political science, psychology, and biology.

THE PRISONERS' DILEMMA: TWO STORIES

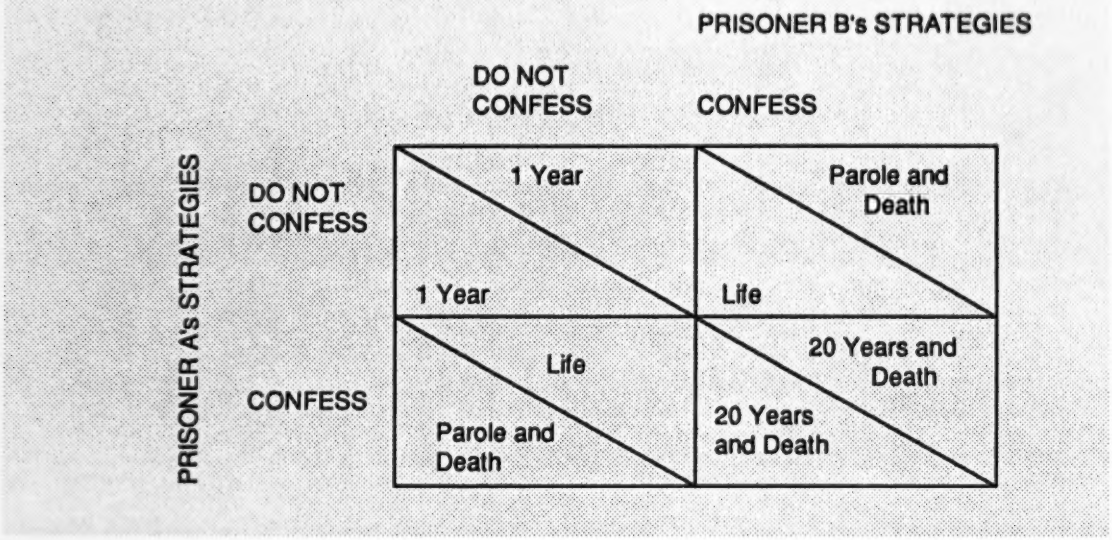
The prisoners' dilemma is the story of two criminals who have been arrested for a heinous crime and are being interrogated separately. Each knows that if neither of them talks, the case against them is weak and they will be convicted and punished for lesser charges. If this happens, each will get one year in prison. If both confess, each will get 20 years in prison. If only one confesses and testifies against the other, the one who did not cooperate with the police will get a life sentence and the one who did cooperate will get parole. Table 1 illustrates the structure of payoffs.

Given this set of payoffs, there is a strong tendency for each to confess. This can be seen by considering the choices and payoffs of either one. If prisoner A remains silent, prisoner B is better off confessing (because parole is better than a year in jail). However, B is also better off confessing if A confesses

TABLE 1 THE PRISONERS' DILEMMA

PRISONER A's STRATEGIES	PRISONER B's STRATEGIES: DO NOT CONFESS	PRISONER B's STRATEGIES: CONFESS
DO NOT CONFESS	1 Year / 1 Year	Parole / Life
CONFESS	Life / Parole	20 Years / 20 Years

TABLE 2 THE PRISONER'S DILEMMA RESOLVED



(because 20 years is better than life). Hence, B will tend to confess regardless of what A will do, and by an identical argument, A will also tend to confess.

The prisoners' dilemma is a case in which actions determined by self-interest are not in the group's interest (where the group is defined to include only the criminals, not the larger society). It is a story which would have pleased Thomas Hobbes, a political theorist of the mid 17th century. Hobbes is a grandparent of economics because he introduced into intellectual discussion the assumptions that the individual was the starting point of social analysis, and that the individual was motivated by self-interest. He believed that the unrestrained pursuit of self-interest would result in chaos. The development of government, with its power to coerce people, was necessary to bring order out of chaos.

However, the story can be retold with a slight alteration. Assume that our two criminals belong to an organization of criminals which will kill any member who confesses to the police or testifies against other members of the organization. With this change, the outcome of the story will tend to be totally different: both will remain silent. Self-interest and group interest are identical. This happens not because the motives or goals of the criminals have changed, but because incentives or payoffs have changed. Table 2 shows the new payoffs. A paradox of this case is that imposition of this "death penalty" can actually improve the well-being of individuals making up the group. One would not normally think that making possible outcomes worse could improve results.

For Hobbes, the introduction of government could change payoffs so that cooperative behavior would replace the "war of all against all." But Adam Smith better illustrates the results of this second story. His *Wealth of Nations* argues that the well-being of the group can be consistent with the pursuit of self-interest if the right incentives, which Smith said were free trade and competition, existed. Nowhere does he explain his point better when he talks about the butcher, baker, and brewer who provide quality products because they love themselves, not because they love humanity.

If the individuals in a group are motivated by self-interest, the group cannot survive

and prosper unless it finds ways to make individual self-interest consistent with group interest. This is a problem for the largest of organized groups, a nation, as well as for many of the subgroups within it. There are two basic ways to deal with this problem. One is the Hobbesian way of regulation and planning from the top. The other is the Smithian way of property rights and the market. Before we consider these two ways in more detail, let us consider some of the assumptions used in the prisoner's dilemma.

THE ASSUMPTION OF SELF-INTEREST

The prisoners' dilemma assumes that the players are selfish, that is, they do not care what happens to the other player. But this assumption is not always true. Sometimes people do worry about others. Suppose, for example, that the two prisoners are fellow revolutionaries dedicated to the ideals of their cause or are husband and wife. In this case, even with the payoffs given in the first table, it is unlikely that either prisoner will confess. Each prisoner in this case considers not just what will happen to him as a result of his decision, but also what will happen to the other prisoner.

However, one should not argue that "good" motives necessarily lead to good results. Suppose there is hard evidence that links two criminals to a crime and that each cares a great deal about the other. If neither confesses, both may serve ten years. Under these circumstances each may confess to the crime, claiming that he alone was responsible in an effort to help his fellow prisoner. But if both try to help the other by admitting guilt, they both may end up serving more time than if each had maintained silence. Of course this would not happen if they could communicate and plan their strategies, but often in life both information and communication are lacking. "Good" motives with poor knowledge can result in harm to the group welfare.

If one ignores problems of information and knowledge, a conclusion one can draw from this chapter's stories about prisoners is that there are two ways for groups (including that largest group, the nation) to get good results. Groups can take motivations or goals as given and try to find incentives (payoffs) that yield desired results, or groups can take incentives as given and try to find motivations or goals which yield desired results. However, a closer look at the assumption of self-interest suggests that the problems of information and knowledge cannot be ignored, and that they place important limitations on the ways groups can organize.

In discussing self-interest, one must distinguish between people's actions and motives in small-group situations and in large-group situations. In small-group situations, as in a family or tribe or village in preindustrial societies, self-interest seems to be only one of many motives determining actions. At least as important are motives such as loyalty, duty, affection, and compassion. In such situations narrow self-interest—the ignoring of the interests of others—is a vice. Small groups often depend on selfless motives to get good results. The most basic of groups, the family, provides a good example. It could not exist without selfless motives. In a family good intentions usually lead to good results because knowledge that family members have about each other is extensive. In small groups it is common for people to consider how their actions affect others in the group.

However, it is dangerous to assume that large groups can be organized in the same way as small groups. As groups get larger, more and more knowledge is needed if good motives are to lead to good results, and less and less is generally available. In addition, as groups grow larger, those affected by a person's actions change from identifiable people to anonymous strangers and this can affect behavior.

When one makes a distinction between small groups and large groups, one finds that the assumptions needed to get "self-interested" behavior are extremely weak. In fact it

is possible to assume perfectly altruistic people, people who care only about the well-being of others, and still end up with self-interested behavior. One need only assume that the altruism is very strong toward the small groups with which people are associated (such as families) and weak or nonexistent toward strangers (the large-group world). For example, a man who is interested in the well-being of his family acts in a way that, as far as the large group is concerned, may not be distinguishable from actions motivated by narrow self-interest. He will demand as much pay as he can get for his work and will try to pay the lowest price he can for the goods he purchases. An appeal made to him to work at a lower pay for the common good is likely to be resisted because it will harm the group he is most interested in helping, his family.

Small-group motives sometimes appear in places where large-group motives would seem more appropriate. For example, in discussing the structure of the Japanese corporation, a manager states: "The most important path to quality is that employees feel that they are of one family, playing an important role in the company....In Japan, an employee tries to work his lifetime with the company he chooses. So he does not put much importance in his personal interests....In Japan, they say, 'Job first, family life comes second.'"[1]

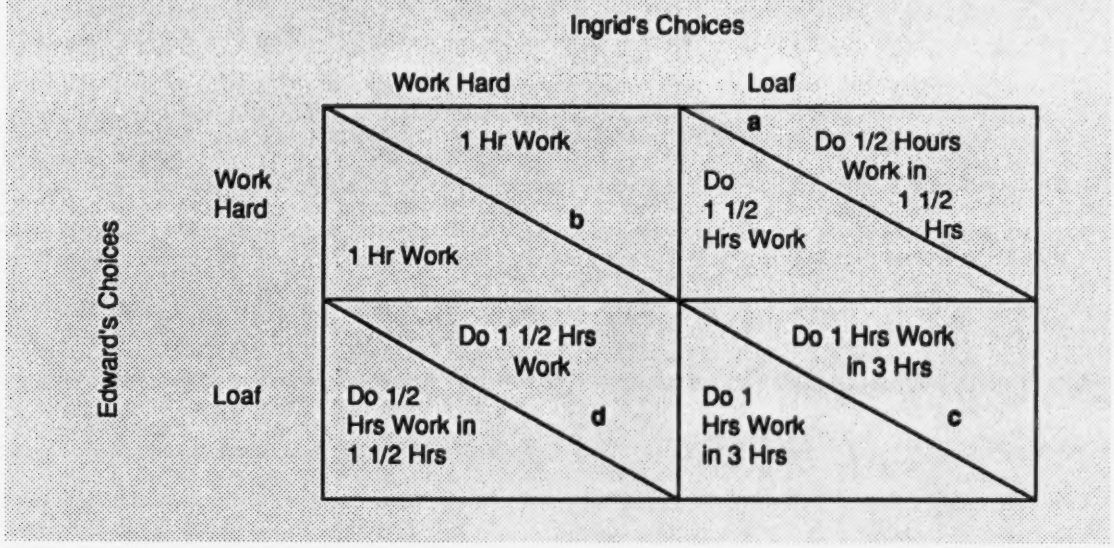
Nevertheless, the distinction between small group-motives and large-group motives suggests that it is very difficult to organize large groups on any other basis than on self-interest. This distinction tells us that it is not enough to convert people from selfishness to altruism, but that the altruism they are converted to must be a *generalized* altruism. People must care as much about strangers as they care about themselves, their families, and their friends.

The Soviet Union has a hero who illustrates the sort of change the transformation requires. Pavlik Morozov turned his father over to authorities in 1932 as an enemy of the people. Apparently his father, the mayor of Garasimovka, gave or sold safe conduct passes to peasants fleeing famine. When thirteen-year-old Pavlik learned of his father's crimes and informed the secret police, his father was executed. His uncle and grandfather then revealed their reactionary natures when they retaliated by killing him. Pavlik became a martyr for the glory of the Soviet state and, as a hero, many schools and youth groups bear his name. For a nation to be organized not on self-interest but on "selfless" motives, people must be like Pavlik. They must consider the interests of anonymous strangers to be at least as important as their own interests and the interests of their family and friends.

Economists have been content to take goals as given and have not tried to develop theories of goal formation. This attitude reflects the hypothesis that it is impossible on a large scale to change people so that they act on the basis of generalized altruism. Not everyone accepts this hypothesis. Most Marxist's governments, governments which invoke the name of Karl Marx as a justification of their policies, believe or profess to believe that man can be transformed so that he does not pursue his own selfish interests but strives only for the welfare of the group. Some of these governments have tried to refute the economists' hypothesis by transforming their citizens. China's Great Leap Forward and Cultural Revolution and Cambodia's bloodbath under the Khmer Rouge are dramatic examples of attempts to make this transformation. Both failed disastrously. If, in the future, someone does refute this hypothesis, it will cause a revolution in economics and greatly diminish the importance of what it has to say. (Needless to say, most economists do not expect this hypothesis to ever be refuted, or else they would not have devoted so much of their time to economics.)

[1]*The Wall Street Journal*, April 29, 1983, p. 14.

TABLE 3 THE PRISONERS' DILEMMA REVISITED



OTHER ASSUMPTIONS

Our story of the prisoners' dilemma assumed that the prisoners' interacted only once. Since no further interaction will take place, neither prisoner needs to take into account any future consequences of his decision. But in real life many situations which appear to resemble the prisoners' dilemma are situations which will repeat.

Consider, for example, the case of Ingrid and Edward in Table 3. Their mother requires them to clean the house each Saturday before they can play. Each has a choice of working hard or loafing. If they both work hard, they can finish in one hour. If they both loaf, the work takes three hours. If one loafs and the other works hard, the job will take an hour and a half. Ingrid ranks the possibilities in Table 3 from best to worst as *a*, *b*, *c*, and *d*. Edward ranks them in a similar way.

The logic of the prisoners' dilemma suggests that both will loaf. However, because Edward and Ingrid must interact each week, the situation is more complex. One's actions now may be able to influence the other's actions in the future. Each must see their strategy not just in terms of how it affects the payoff this week, but how it will affect the payoffs in the future as well. What one player does will affect the strategy of the other, and in turn this result can affect the strategy of the original player. This chain of decisions coming back to affect future decisions is a case of feedback, and it greatly complicates the problem of deciding strategy.

What strategy should a player choose? There is no one best strategy for all circumstances, but one which works extremely well over a wide variety of environments is a simple tit-for-tat strategy. In this strategy one begins by cooperating, and then mimics the other player's moves. Tit-for-tat is "nice" in that it is willing to cooperate, and it does not bear a grudge. It also cannot be exploited, because any "defection" from cooperation will be returned.

If Ingrid uses a tit-for-tat strategy in our example above, she will work hard the first week. If she then discovers that Edward has loafed, she will loaf the next week. If, after he realizes that he cannot exploit her, he becomes ready to cooperate, a tit-for-tat strategy is ready to begin cooperating.

The power of tit-for-tat in encouraging

TABLE 4 HAND OR FIST

		MAJORITY OF CLASS: Hand	MAJORITY OF CLASS: Fist
YOU	Hand	20	0
YOU	Fist	30	10

cooperation in unusual places has been explored by Robert Axelrod in *The Evolution of Cooperation* (Basic Books, 1984). He argues that it could explain the many spontaneous outbreaks of "peace" in trench warfare during World War I. In the early stages of this warfare, informal and unspoken agreements often existed in which neither side would fire to kill the enemy when major battles were not underway. The best position for the soldiers on each side would have been one in which they could "exploit" the enemy by killing him with no fear of retaliation. Then when a major battle came, the enemy would be weaker and the chances of surviving the major battle would be better. However this was not an attainable position because the other side would retaliate.

The informal cease-fires along the front indicates the ability of cooperation to arise when no altruism at all is involved. The generals on both sides who managed the war safely behind the lines deplored the refusal of troops to kill the enemy between the ordered offenses. They could and did issue orders telling their men that killing the enemy was to be a daily affair, but they could not be sure that these orders were in fact carried out. Only by accident did they discover a way to eliminate informal peace. The British began a policy of raiding the enemy, and a raiding party was expected to bring back prisoners or to suffer deaths trying. There was no way to fake these results, and as a result the cooperation that had arisen between enemies collapsed.

A final assumption we made in our story of the prisoners' dilemma was that only two individuals played. To see that the logic of the prisoner's dilemma is preserved and, indeed, strengthened when there are multiple players, consider the following classroom game. Your instructor divides your room into two groups. You must decide in each round of play whether to hold up a hand or a fist. Your score depends both on your decision and on how the majority of the other half of the class play. Table 4 shows the payoffs. Your goal is to score as many points as possible.

What will happen in this game? Perhaps you can try it and see. With most groups which play this game only a few hands are left after three or four rounds. (Notice that the problem of the commons, discussed in the last chapter, is identical to a prisoner's dilemma game with many people playing.)

TWO WAYS OF COORDINATION

The prisoner's dilemma indicates that if people act on the basis of self interest and there are no restrictions on their behavior, the results will not be in the interests of the group. The welfare of the group requires that some way be found to coordinate behavior and eliminate the conflicts involved in prisoner-dilemma situations. Groups have found two basic solutions.

One way involves establishing property rights and allowing markets to develop. Property rights make a decision maker consider all the costs and benefits of his decision. For example, consider the overgrazing problem in the last chapter. If each of the herders has to confine his cows to his own plot of land, then if he overgrazes the land, he will not be able to shift the costs of that decision to others who are using the land. As a result, he has an incentive to limit the size of his herd. Examining the way in which markets work will fill most of the the following chapters.

The second and more direct way is to have a strong central authority which regulates people's behavior and punishes deviations. Hunting regulations illustrate this method. Wild ducks are owned by no one. As a result, the problem of the commons should apply, and ducks should be hunted to extinction. They are not because governments set limits on when and where ducks may be hunted, and on how many ducks each hunter may kill. To the individual hunter these restrictions may seem as irritating limitations on his freedom. But without them, hunters as a group would be much worse off.

The use of central authority as a way of coordinating behavior is very widespread. It is the method which allows large business firms to exist. The boss coordinates his subordinates, directing them to actions which are in the interest of the all those who make up the firm. This solution is used in a more extreme form in the socialist economies of Eastern Europe and Asia. These economies are designed as if they were one giant firm. The bulk of economic decisions, such as what to produce and how to produce it, are made by government bureaucracies.

Which method, the market or central direction, is better? Evidence suggests that sometime the first is, and sometimes the second is. There are costs to using either method. As a result, no country totally relies on either. However, the Marxist nations have in the past struggled to eliminate coordination through property rights and the market. One of the important political changes of the 1980s has been the acknowledgement by the leadership of the Soviet Union and of China that their reliance on central coordination has been excessive.

Both ways of coordination rely on changing incentives, not people's goals. The basic idea in any set of incentives is that when some action is made more costly, people will do less of it. This simple idea has a multitude of complications when it is applied in the real world, which is fortunate for economists, or else they would not have nearly as much to study. In practice, virtually all attempts to change behavior by changing incentives produces changes more complex than those intended.

Those who designed the Soviet economic system began with a belief that "the problem with capitalism is that it produces for profit instead of for people's needs," and they set out to build a system that produces directly for people's needs and not at all for profit. "There was a period early in Soviet life when it was argued that Soviet worker and manager would work because of their enthusiasm for the revolution and their ideological fervor. That phase passed rather quickly."[3] Since use of markets violated Marxist ideology, there was only one system of coordination possible. A system of central planning evolved, a system in which all decisions about what people need are decided from the

[3] Marshall Goldman, *U.S.S.R in Crisis: The Failure of an Economic System*, (New York: W.W. Norton & Co., 1983).

top.

To see how this system works, consider first how the operator of a shoe factory in the United States would make decisions. His major concern would be whether he could sell at a profit the shoes he made. In the Soviet Union, however, profit is of no concern to the manager of the state-owned shoe factory. Neither does he have to worry about selling the shoes. He only has to worry about producing what he is told to produce, and if he can do that, both he and the workers of the plant will receive sizable bonuses. The problem the Soviet Union has is that it is very difficult to specify in physical terms what the manager should do. (If you do not believe this, try to write down a set of instructions specifying what sort of shoes should be produced. Remember, instructions to produce "good shoes" or "attractive shoes" involve instructions that are not measurable.) The Soviet Union has produced huge numbers of shoes that no one will buy because they are of such low quality.

Or consider a nail factory. If it is told to produce as many nails as possible, it will only produce small nails. If told to produce as large a weight as possible, it will only produce very large nails. The Soviet Union has wasted billions of rubles searching for energy because it rewards drilling crews on the basis of the number of feet drilled. Because it is easier to drill many shallow wells than a few deep wells, drillers have drilled lots of shallow wells regardless of what was advisable geologically.

Incentives can be given whenever there are attempts to measure performance. In a series on the Soviet Union, the *Chicago Sun Times* reported a case in which a hospital had turned away a seriously ill patient because "they were nearing their yearly quota for patient deaths—and would be criticized by authorities if they exceeded it."[3] Certainly a good hospital should have fewer deaths than a bad hospital, other things constant. Thus it seems reasonable to ask hospitals for their death statistics, and these could be used to evaluate them. If they are evaluated on the basis of this statistic, they have the incentive to provide quality care. But they also have the incentive to avoid patients who are likely to die.

One need not go to the Soviet Union for examples of incentives with unintended results. An incentive problem occurred in the Job Corp program in the United States in the late 1960s which was much like the hospital example discussed in the previous paragraph. Job Corp was designed to provide job training for those who had very low levels of skills. In evaluating various centers that implemented the program, an attempt was made to see how many of those who went through the training got jobs. This statistic was used to determine how funding would be distributed in the future. On the surface this seems a very reasonable way to evaluate each training center. Those which are good should have had a higher placement rate for their graduates than those which were poor. However, this evaluation method had an undesirable consequence. Training centers began to try to attract people who were only moderately deficient in skills because they would be more likely to get a job and they began to discourage those who were severely deficient from the program.

A reason that designing effective incentives is so difficult is that information and knowledge are scarce. People have a limited capacity to know. In small groups people know a great deal about others simply from day-to-day interaction. But in large groups knowledge about others requires expenditure of time and effort. For a modern, complex economy to function well, people must coordinate their actions with the actions of many people, but all of these people have very limited knowledge of how their actions fit into the big picture. A good set of incentives gives people the essential information they need to know so that their decisions will mesh with others, and then encourages them to make those decisions. Not all sets of incentives, as we will see, do this task equally well, and none is without some problems.

[3]Nov 22, 1983, p. 4.

EXCHANGE AND POLITICS

The discussion of the prisoners' dilemma and the distinction between small groups and large groups suggests that economists are likely to have little to say about small-group situations. In fact, they have written very little, for example, about nomadic tribes or the interactions within the family. The realm of the economist has been in large-group situations in which individuals interact with others who they do not know well or at all. In these situations the assumption of self-interest seems to serve quite well even if it is not literally true. The area in which the analytical tools of economics have been most useful has been the area of exchange.

In small groups the role of exchange is replaced with gift-giving. A member of a family who has no food will be given food by those who do. But gift-giving usually has strings attached. People who receive gifts are expected to reciprocate, to give back something in the future. This reciprocity helps bind small groups together.

Exchange does not bind people together in the same way. Two people exchange only when both benefit. Neither incurs a social obligation as a result. In fact, where social obligations exist, exchange may not work well. Most people are uncomfortable negotiating a purchase from or sale to a close friend.

Exchange allows for extremely complex interactions among strangers. When you use a pencil, for example, you benefit from efforts of hundreds of people who in some way contributed to getting that pencil to you. Wood had to be grown, cut, and shaped. Graphite had to be mined, transported, and processed. Iron had to be mined, refined, and molded. The paint and eraser each required their own processes. All of the many people involved are probably total strangers to you.

Most of economics is devoted to discussing exchange, and the next chapter begins our discussion of it. Economists also spend time examining other topics. Of those other topics, the one which has drawn the most research is the study of government. However, the economic theory of government is less advanced than the theory of exchange for at least three reasons. First, often specific individuals are very important in government, and economics does not deal well with specific individuals. In monarchies and dictatorships, for example, the decisions of one individual may outweigh the decisions of all others. Economics seeks regularities in social life, and those regularities are more likely to occur when no one individual has appreciable effects on the group.

A second reason is that only fairly recently did economists realize that their analytical tools could be used to explain behavior in government. Economists usually assume that people are motivated by self-interest, but for many years they implicitly assumed that once the government employed a person, his motivations changed to unselfish and his knowledge became infinite. No economist ever stated this assumption; rather this was a hidden assumption in discussing the role of the government. This assumption allowed economists to treat the government as solution to problems. If, for example, the private market did not perform well, the government could remedy the problem. It was only in the 1960s and 1970s that economists fully realized that they had made what was for them a most unusual assumption about behavior. Some of the most interesting and informative research undertaken in the 1970s was that which asked what would one expect if one assumes that those who work for the government are in fact no different from the rest of us, and that they seek only their own self-interest. This research suggested that the government might often make a bad situation worse.

A third reason is that the assumption of self-interest may not work as well in politics as in exchange. Politicians can and do make use of people's small-group responses. For example, many people feel loyalty to nation, party, or political personality. This loyalty can alter behavior from what it would be if

based only on self-interest. We will take a closer look at the topic of the government and economic performance in Chapter 13.

SUMMARY

This chapter considered the question of how individual motives and group results are related. It found that one cannot predict group results simply by knowing individual motives, but that group results also depend on incentives and the availability of information to those in the group. As a result, individual actions can have unintended group results. This chapter discussed two ways of coordinating decisions, and also explained why economists spend so much time discussing exchange, a topic to which we now turn.

QUESTIONS

1. The discussion in Chapter 2 suggested that there was a tendency to overgraze land open to all. (a) Suppose that there are only two herders but that each could control up to 300 cattle. Would this change the conclusion? (Hint: Use Table 3 from the the last chapter and draw a payoff matrix assuming that the strategies are "Graze 200" and "Graze 300." Then notice that this is a case in which there are many plays in the game, not just one.)

(b) Suppose that there are 100 herders as in the original example, but that the king demands 20% of milk production as a tax. What would he do if he wanted to maximize his tax receipts?

2. An arms race can be seen as a case of a prisoners' dilemma. Draw a payoff matrix showing the results of strategies "less armament" and "more armament" for two hostile nations. (Hint: Assume that war is a result of mistakes, that is, a nation does not go to war if they believe that they will lose. Payoffs then include "stalemate," "dominance," and "subservience.")

3. (A bit advanced) In the table below the numbers represent gains for Smith and losses for Jones. What is the best strategy for Smith? Why? What is the best strategy for Jones? Why? (Comment: This is a zero-sum game. Can you see why?)

Smith's Strategies

Jones' Strategies	A	B	C
A	16	12	14
B	2	10	9
C	5	4	7

4. In 1800 buffalo were much more numerous in the United States than were cattle. By 1900 cattle were much more numerous than buffalo. What is the key to explaining the different fates of the buffalo and cattle? (Comment: The answer which this chapter suggests is incomplete. The U.S. Army also encouraged the destruction of buffalo in its attempt to defeat the Plains Indians.)

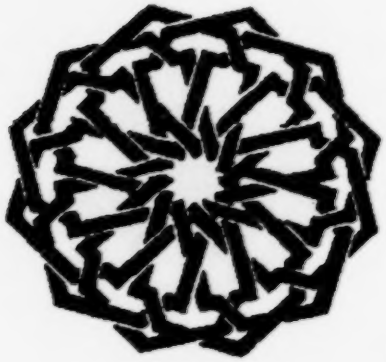
5. Some years ago the farmers in one of the Caribbean nations were having a problem with snakes which ate chicken eggs. To solve the problem, the government instituted a bounty on the snakes. The program worked well at first, but then the authorities noticed that rather than decreasing, the number of snakes being turned in was increasing. Investigating, they found that the bounty had been set too high. What unwanted incentive would very high bounties give people?

6. (a) Using the definitions from the last chapter, how would you classify each of the four possible outcomes in Table 3: as stable equilibrium, as unstable equilibrium, or as a situation of disequilibrium? Explain your reasons for each choice.
(b) The definition of equilibrium which economists use in game theory is Nash equilibrium. A Nash equilibrium (named after the economist who first defined it) exists when each player finds that there is no way to improve his results given the strategies played by the other player(s). Where will the Nash equilibrium be in Table 3?

7. Primitive societies of hunter-gatherers have neither property rights nor strong central authorities. (a) How can they avoid the problems of coordination and conflict over scarce resources? (Hint: They also have very low population densities. What does this do to a problem of the commons?)
(b) Does your answer suggest a theory about how and when property rights come into being?

8. Evaluate the following statement: "The problem with capitalism is that it produces for profits instead of for people's needs."

9. Can you switch two numbers in Table 4 so that self-interest is harmonized with group interest?



CHAPTER 4

THE MODEL OF SUPPLY AND DEMAND

After you read this chapter and work the problems at the end, you should be able to:

Define demand, supply, inferior good, normal good, substitute, complement, law of demand, price taker, price searcher, market-clearing price.

Distinguish between changes in demand and changes in quantity demanded.

Distinguish between changes in supply and changes in quantity supplied.

Predict how changes in factors such as income, prices of substitutes, prices of inputs, etc. affect the supply and demand curves and equilibrium quantity and price.

Explain why we can treat the demand curve as positions of buyer equilibrium and the supply curve as positions of seller equilibrium.

The last three chapters have told you that economists analyze the results of people's actions when these actions are based on self-interest. When actions are based on self-interest, people respond to incentives, that is, to costs and benefits. When the costs of an activity are raised, or the benefits reduced, people do less of the activity. In examining what happens in a market, economists have found that they can use this simple idea of action based on costs and benefits to construct a model (or theory) which can explain how many markets work. This model is the model of supply and demand. It is perhaps the most basic of the models economists use to explain the world around them.

Given the model's importance in the way modern economists think, it is surprising that one does not find the model in the writings of Adam Smith, David Ricardo, Thomas Malthus, or John Stuart Mill, though all of these pioneers in economics used the words "supply" and "demand" frequently. The modern supply-and-demand model does not appear until 1890, when Alfred Marshall published his *Principles of Economics*.

DEMAND

What determines the amount of a product that people are willing to buy during some period of time? For example, what determines the amount of hamburger purchased in Chicago during a week? Economists answer such questions by examining the costs and benefits of buying the product. When any of the costs or benefits change, the amount of the product which people will buy should also change.

The benefits a person gets from a product depend on his goals. These goals are referred to in many ways in discussions of demand. The words "tastes," "wants," "needs," "preferences," and "usefulness" all refer to goals. When peoples' goals change, the amount of benefit they get from the good changes, and this will cause them to change the amount of the good they want to buy.

Goals (or preferences or tastes) depend on many factors, such as the age of people and the amount of education they have had. Social custom is an important determinant of preferences and can account for many differences in demand among groups. One can explain the large differences in squid sales in Japan and the United States, or the large differences in consumption of horse meat in Europe and the United States, almost entirely in terms of differences in preferences caused by differences in social custom.

The most obvious cost a person bears in buying a product is the price of the product. Price reflects cost because people have a limited amount of funds which they can spend, and if they spend their money on one thing, they cannot spend it on another. When the price of a product goes up, the amount of other things which a person must give up in order to buy the product rises. As a result, we expect people to buy more hamburger if the price is $1.00 per pound than if it is $2.00 per pound.

It follows that the amount of income people receive should also be important. The amount of income determines the options which a person must give up when he buys a product. If a person with a low income spends $5000 for a trip around the world, he will have to cut back on food, clothing, or shelter. The same trip will cause a person with a high income to cut back on a very different set of options.

Increases in people's incomes lead to more consumption of most products. These products are called **normal** goods. There are some products, however, which people use less of as their income increases, and these products are called **inferior** goods. Public transportation is an example—as people's incomes rise, they stop riding the bus and drive their own cars. Blue jeans were once another example—people with higher incomes bought them less frequently than people with lower incomes. It was because they were a symbol of "working class" clothes that they were adopted by the radical left in the 1960s, and from there they moved into high fashion.

Prices of related goods are also important.

Goods which are **substitutes** satisfy the same set of goals or preferences. An example of a substitute for hamburger is pork. If pork prices are high, people are tempted to shift away from pork to hamburger, and if pork prices are low, people are tempted to shift from hamburger to pork. The opposite of a substitute is a **complement**, a good which helps complete another in some way. Catsup and hamburger buns are complements to hamburger, and if they are priced low enough, consumption of hamburger may rise. Sometimes goods are such good complements that they are sold together and we think of them as a single item. Left shoes and right shoes are an example.

There are other factors that can influence the amount of a particular product that people are willing to buy, such as the number of consumers in the market and their expectations about future prices, incomes, and quality changes. To get a complete list for any product might be time consuming and difficult, but it is not necessary because we want to consider only the relationship between price and the quantity of a product that people are willing to buy during some interval of time. To do this we will assume all other factors are held constant.

The relationship between price and the amount of a product people want to buy is what economists call the **demand curve**. This relationship is inverse or indirect. This means that as price gets higher, people want less of a particular product. This inverse relationship is almost always found in studies of particular products, and its very widespread occurrence has given it a special name: **the law of demand**. The word "law" in this case does not refer to a bill that the government has passed but to an observed regularity.

TABLE 1
A DEMAND CURVE

PRICE OF WIDGETS	NUMBER OF WIDGETS BOUGHT
$1.00	100
$2.00	90
$3.00	70
$4.00	40

There are various ways to express the relationship between price and the quantity that people will buy. Mathematically one can say that quantity demanded is a function of price, with other factors held constant, or:

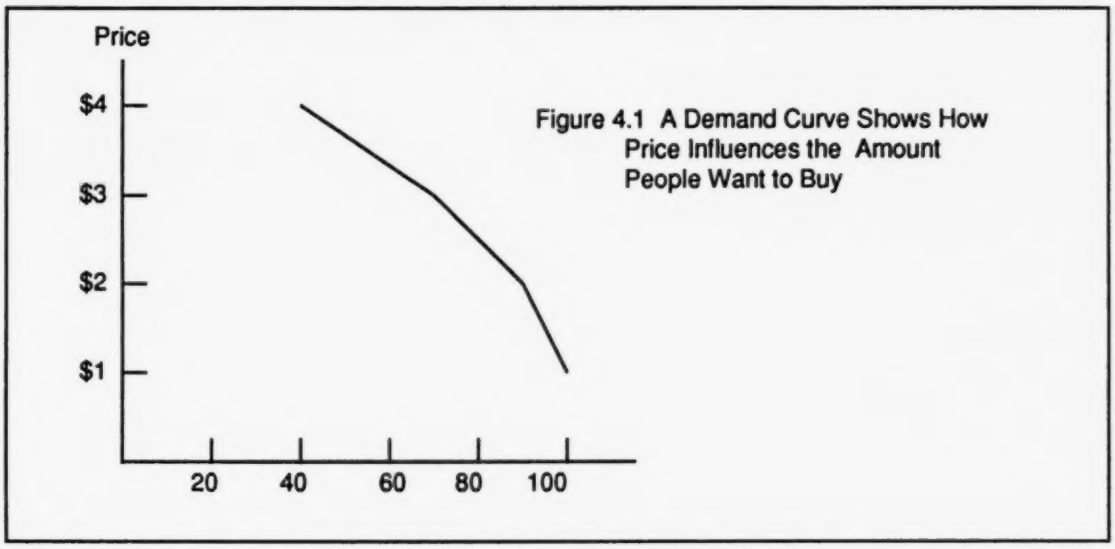


Figure 4.1 A Demand Curve Shows How Price Influences the Amount People Want to Buy

TABLE 2
A DEMAND CURVE CAN SHIFT

PRICE	QUANTITY
$1.00	[100] becomes 80
$2.00	[90] becomes 70
$3.00	[70] becomes 50
$4.00	[40] becomes 10

Qd = f(Price, other factors held constant)

A more elementary way to capture the relationship is in the form of a table. The numbers in Table 1 are what one expects in a demand curve: as price goes up, the amount people are willing to buy decreases. (A widget is an imaginary product that some economist invented when he could not think of a real product to use in illustrating an idea.) The same information can also be plotted on a graph, where it will look like the graph in Figure 1. (To follow mathematical convention, quantity should be on the vertical axis since quantity depends on price. But Alfred Marshall put price on the vertical axis when he developed the modern treatment of supply and demand in 1890, and his way has become tradition.)

If one of the factors which is being held constant becomes unstuck, changes, and then is held constant again, the relationship between price and quantity will change. For example, suppose the price of getwids, a substitute for widgets, falls. Then people who previously were buying widgets will reconsider their choices, and some may decide to switch to getwids. This would be true at all possible prices for widgets. These changes in the way people will behave at each price will change the demand curve to look like Table 2 and Figure 2.

If the price of widgets is originally $1.00 and people are buying 100, they may change to 90 for two reasons. One reason is that the price may rise to $2.00. The other reason is that one of the factors which is assumed constant may change, so that even though the price has not changed, quantity will. Economists distinguish these two cases. In the first case the demand relationship or schedule has not changed, but there has been movement within the relationship. Economists call a change of this sort a **change in quantity demanded.** The second sort of change is an alteration of the relationship. The original pairing of price and quantity is destroyed and replaced by a new pairing.

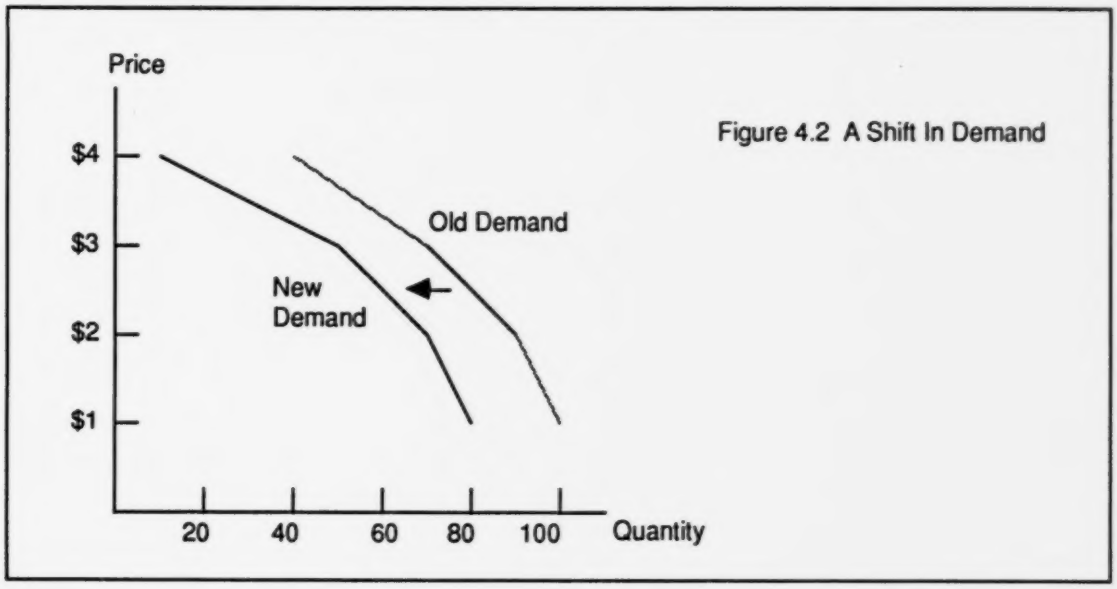


Figure 4.2 A Shift In Demand

Economists call this sort of change a **change in demand**.

It is important to realize that though the demand relationship looks concrete when it is illustrated with a table or graph, in everyday life demand curves are hidden. A demand curve refers to what people would do if various prices were charged, and very rarely are enough prices charged so a clear demand curve can be seen. This is not to say that the concept is of no importance to people who sell. They may not be interested in the demand curve as a relationship, but they do find it a boundary or constraint on their behavior. If there were an actual widget seller facing the demand curve in Table 1, he would find that he could not sell more than 90 widgets if he wanted to charge $2.00. He could of course sell fewer if he wanted to. He could sell only 70 at $2.00, but if he did this he would earn far less than he could. If he wanted to sell more than 90, he would have to lower his price.

Thus, to an actual businessman the demand curve is important as a limitation on what he can do. A businessman may not know exactly where the demand curve is, and he may not think of it as fixed. Advertising—either informing or persuading people—can move the boundary. As we proceed further, we will see that there are still other ways to view the demand curve in addition to seeing it as a mathematical relationship and as a boundary limiting sellers.

SUPPLY

What determines the amount of a good or service that people are willing to sell during some period of time? We saw in Chapter 2 that people sell things because it is a way, indirect but effective, of obtaining other things which they prefer. Sellers intend to make a profit from their sales, and economists assume that they want their profits as large as possible. Since profit is the difference between benefits in the form of revenues and costs, anything which influences revenues or costs can influence the amounts sellers want to sell.

Revenue is found by multiplying the price of the product by the amount sold. A change in price changes revenues, and hence profits, so it is a major determinant of the amount sellers will want to sell. Since a higher price leads to higher profit, and a higher profit leads to a larger amount that sellers will want to sell, one expects that a greater quantity should be supplied when price is higher. Thus, the relationship between quantity that sellers will sell and price should be direct or positive. Though this is almost always the case, there are a few exceptions. An example is labor; as wages go up, people may decide to enjoy their higher wages and work less. As a result, there is no law of supply that matches the law of demand.

The cost of something is what must be given up in order to get it. Often these costs are only monetary, in which case they are easy to see. If the price of an input increases, the cost of the output will increase, and, other things held constant, profits will decrease. The seller will then have to decide if shifting part of his resources and effort to other products will improve his well-being.

Production costs are determined not only by the prices of inputs, but also by **technology**. Technology represents the knowledge of how inputs (such as labor, raw materials, energy, and machinery) can be combined to produce the product. If this knowledge increases, so that people find cheaper ways to make the same output, then, other things held constant, profit would increase and we expect sellers to respond by producing more.

Costs may be nonmonetary as well as monetary. For example, a farmer who plants corn takes the expected price of soybeans into account in deciding how much corn to plant. If soybeans are expected to sell for a high price, then the farmer may find that shifting some of his land from corn production to soybean production will increase profit. The decision to plant corn means that the farmer gives up the opportunity to plant soybeans (as well as giving up the money for seed, fuel, equipment, and labor). Since we have defined cost as what must be given up

TABLE 3 A SUPPLY CURVE

PRICE	QUANTITY SUPPLIED
$1.00	10
$2.00	40
$3.00	70
$4.00	140

to get something, the prices of other goods that sellers could otherwise produce and sell must be part of the calculation of the cost of production.

There are other factors that can influence the amount of a product that sellers will sell, such as the number of sellers, expectations about the future, and whether or not there are by-products in production that are valuable. (An example of a valuable by-product is cottonseed in the production of cotton. A farmer who produces cotton also gets cottonseed, which yields cottonseed oil, a widely-used vegetable oil.) But as in the discussion of demand, the emphasis in the discussion of supply is on the relationship between quantity and price. To focus on this relationship, all other factors must be assumed to be constant.

There is another assumption that has not yet been clearly stated though it applies to demand as well as to supply. For a supply curve to exist, there must be a large number of sellers in the market, and for a demand curve to exist, there must be many buyers.. In both cases there must be enough so that no one believes that what he does will influence price. In terms which were first introduced into economics in the 1950s and which have become quite popular, everyone must be a **price taker** and no one can be a **price searcher**. A price searcher is one with ability to set the price in a transaction, while a price taker cannot influence the price but must take or leave it. The ordinary consumer knows the role of price taker well. When he goes to the store, he can buy one or twenty gallons of milk and it does not change the price. The assumption that both buyers and sellers are price takers is a crucial assumption, and often it is not true with regard to sellers. When it is not true, caution must be taken when using the supply and demand model which lies in the pages ahead.

The relationship between the quantity sellers want to sell during some time period (quantity supplied) and price can be expressed mathematically in functional form as:

Qs = f(price, other factors held constant).

It can also be illustrated in the form of a table or a graph, as in Table 3 and Figure 3. The graph has a positive slope, which is the slope one normally expects from a supply curve.

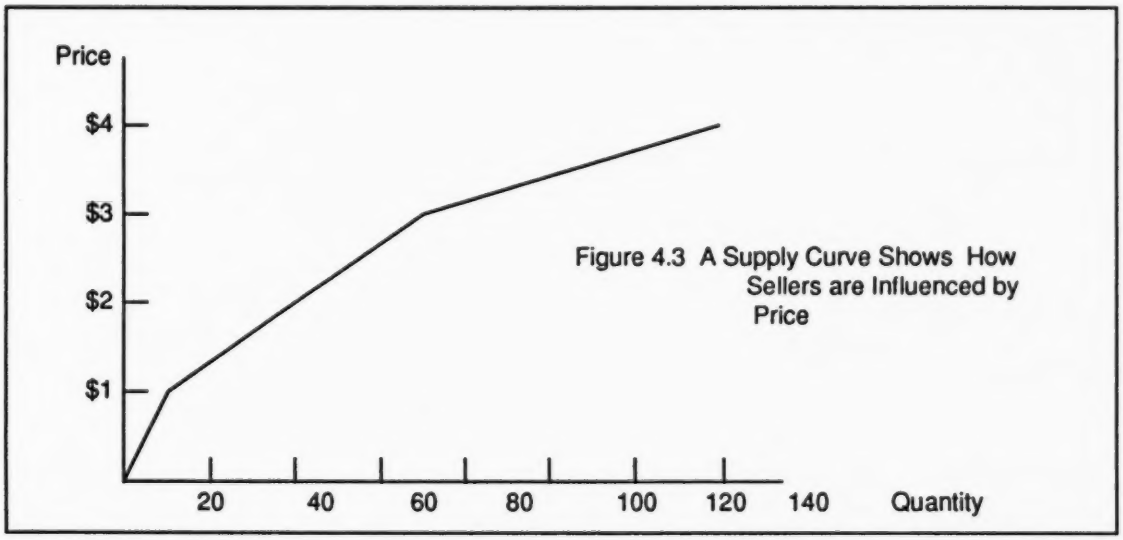


Figure 4.3 A Supply Curve Shows How Sellers are Influenced by Price

TABLE 4
A SUPPLY CURVE CAN SHIFT TOO

PRICE	QUANTITY SUPPLIED
$1.00	[10] becomes 20
$2.00	[40] becomes 60
$3.00	[70] becomes 100
$4.00	[140] becomes 180

If one of the factors which is held constant changes, the relationship between price and quantity, which is supply, will change. If the price of an input falls, for example, the supply relationship may change as in Table 4 and Figure 4.

As with demand, economists separate changes in the amount that sellers will sell into two categories. A **change in supply** refers to a change in behavior of sellers caused because a factor held constant has changed. As a result of a change in supply, there is a new relationship between price and quantity. At each price there will be a new quantity and at each quantity there will be a new price. A **change in quantity supplied** refers to a change in behavior of sellers caused because price has changed. In this case the relationship between price and quantity remains unchanged, but a new pair in the list of all possible pairs of price and quantity has been realized.

Supply curves as well as demand curves appear much more concrete on an economist's graph than they appear in real markets. A supply curve is mostly potential—what will happen if certain prices are charged, most of which will never be charged. From the buyer's perspective, the supply curve has more meaning as a boundary than as a relationship. The supply curve says that only certain price-quantity pairs will be available to buyers, those lying left of the supply curve.

THE MODEL OF SUPPLY AND DEMAND

To this point we have developed two behavioral statements, or assertions about how people will act. The first says that the amount buyers will buy depends on price and other factors which are assumed constant. The second says that the amount sellers will sell depends on price and other factors which are assumed constant. In mathematical terms our model is:

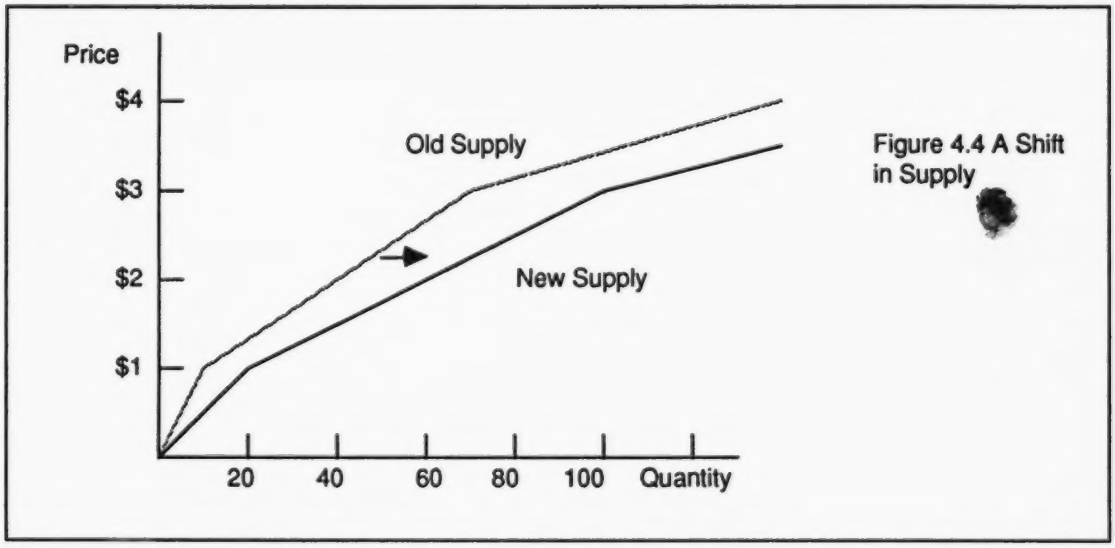


Figure 4.4 A Shift in Supply

TABLE 5
SUPPLY AND DEMAND TOGETHER AT LAST

PRICE	Qd	Qs
$1.00	100	10
$2.00	90	40
$3.00	70	70
$4.00	40	140

Qd = f(price, constants)

Qs = g(price, constants).

This is not a complete model. Mathematically the problem is that we have three variables (Qd, Qs, price) and only two equations, and this system will not have a solution. To complete the system we need to add another equation, and this will be an equilibrium condition. The equation is very simple:

Qd = Qs.

It says that equilibrium exists if the amount sellers are willing to sell is equal to the amount buyers are willing to buy.

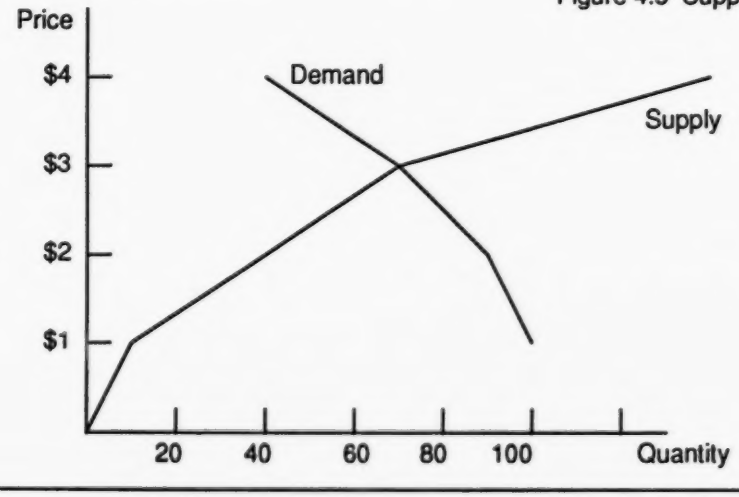
Consider Tables 1 and 3 and Figures 1 and 3. If we combine them, we get the Table 5 and Figure 5. It should be obvious that the price of $3.00 is the equilibrium price and the quantity of 70 is the equilibrium quantity. At any other price, sellers would want to sell a different amount than buyers want to buy. On the graph, the equilibrium price and quantity are indicated by the intersection of the supply and demand curves.

If one of the many factors which is being held constant changes, then equilibrium price and quantity will change. Further, if we know which factor changes, we can often predict the direction of changes, though rarely the exact magnitude. For example, the market for wheat fits the requirements of the supply and demand model quite well. Suppose there is a drought in the main wheat producing areas of the United States. How will we show this on a supply and demand graph such as Figure 5? Should we move the demand curve, or the supply curve, or both? What will happen to equilibrium price and quantity?

A dangerous way to answer these questions is to first try to decide what will happen to price and quantity and then decide what will happen to the supply and demand curves. This is a route to disaster. Rather one must first decide how the curves will shift, and from the shifts in the curves decide how price and quantity would change.

What should happen as the result of the

Figure 4.5 Supply and Demand



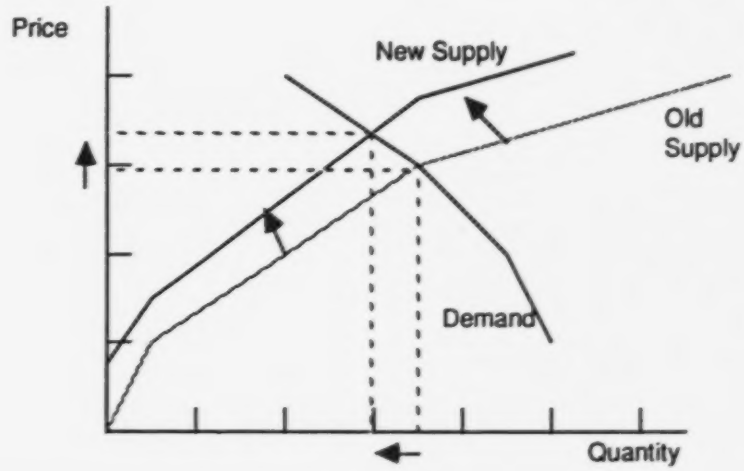
drought? One begins by asking whether buyers would change the amount they purchased if price did not change and whether sellers would change the amount sold if price did not change. On reflection one realizes that this event will change seller behavior at the given price, but is highly unlikely to change buyer behavior (unless one assumes that more than the drought occurs, such as a change in expectations caused by the drought). Further, at any price, the drought will reduce the amount sellers will sell. Thus, the supply curve will shift to the left and the demand curve will not change. There will be a change in supply and a change in quantity demanded. The new equilibrium will have a higher price and a lower quantity. These changes are shown in Figure 6.

What should one predict if a new diet calling for the consumption of two loaves of whole wheat bread sweeps through the U.S.? Again one must ask whether the behavior of buyers or sellers will change if price does not change. Reflection should tell you that it will be behavior of buyers which would change. Buyers would want more wheat at each possible price. The demand curve shifts to the right, which results in higher equilibrium price and quantity. Sellers would also change their behavior, but only because price changed.

The model of supply and demand requires that buyers and sellers be clearly defined groups. Notice that in the list of factors which affected buyers and sellers, the only common factor was price. Few people who buy hamburger know or care about the price of cattle feed or the details of cattle breeding. Cattle raisers do not care what the income of the buyers is or what the prices of related goods are unless they affect the price of cattle. Thus, when one factor changes, it affects only one curve, not both. When buyers and sellers cannot be clearly distinguished, as in the New York Stock Exchange, where the people who are buyers one minute may be sellers the next, one cannot talk about distinct and separate supply and demand curves.

The model of supply and demand also assumes that both buyers and sellers have good information about the products qualities and availability. If information is not good, the same product may sell for a variety of prices. Often, however, what seems to be the same product at different prices can be considered a variety of products. A pound of

Figure 4.6 Shifting the Supply Curve Moves Us along the Demand Curve



hamburger for which one has to wait 15 minutes in a check-out line can be considered a different product than identical meat that one can buy without waiting. Chapters 12 and 16 look at cases in which information is not good.

In addition, the supply and demand model needs well-defined property rights. Chapter 3 suggests this conclusion in its discussion of how property rights and markets provide one way of coordinating decisions. When property rights are not clearly defined, the seller may be able to ignore some of the costs of production, which will then be imposed on others. Alternatively, buyers may not get all the benefits from purchasing a product. Others may get some of the benefits without payment. Chapters 12 and 14 will consider these cases.

Finally, as was noted above, the supply and demand model requires many buyers and sellers. If there is only one seller, the seller can search along the demand curve of the buyers for the position that is most profitable. In this case it is not just price that matters, but the slope of the demand curve as well. The seller in this case is not a price taker, but a price searcher. Chapter 15 will examine how markets with price searchers function.

Even if the assumptions underlying supply and demand are not met exactly, and they rarely are, the model often provides a fairly good approximation of a situation, good enough so that predictions based on the model are in the right direction. This ability of the model to predict even when some assumptions are not quite satisfied is a reason economists like the model so much.

THE ADJUSTMENT PROCESS

We have developed the model of supply and demand as an equilibrium model. We have said nothing about how adjustments from disequilibrium to equilibrium take place. To develop this idea, it is useful to take still another view of supply and demand curves, to view demand as points of buyer equilibrium and supply as points of seller equilibrium.

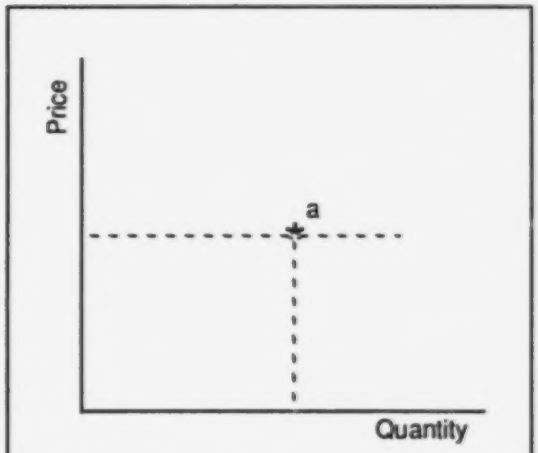
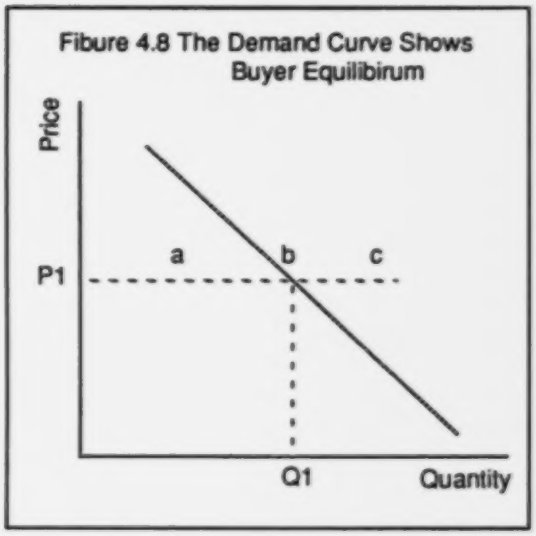


Figure 4.7 Is Point *a* on the Demand Curve?

Suppose price is at P1 in Figure 7. Will point a be a point on the demand curve? If people would like to buy more than Q1 at price P1, point a must lie to the left of the demand curve. In this case some consumers are unhappy with the amount they have purchased, and will try to purchase more. If there is no more to purchase, some will attempt to offer more money for the product, or they will increase the time they devote to getting the product. The important idea is that if point a lies to the left of the demand curve, people will be unhappy with their situation and will change their behavior. If point a lies to the right of the demand curve, people will decide that they are buying too much of the product and will cut purchases. Again, if point a is not on the demand curve, people will change their behavior.

This analysis indicates that positions off the demand curve are not positions of buyer equilibrium. They also help explain why the demand curve can be considered a boundary. Though buyers may not be in equilibrium at point a in Figure 8, they can be held there and they can adjust in ways that do not change the money price. They cannot be held



Fibure 4.8 The Demand Curve Shows Buyer Equilibirum

at point b unless there is some way to force people to buy a product when they do not want it.

Point c in Figure 8 is a position of buyer equilibrium because given price P1, people will be satisfied with Q1 and will do nothing to change their behavior. Buyers would, of course, prefer a lower price than P1—they are always willing to move down the demand curve. However, this is not the issue here.

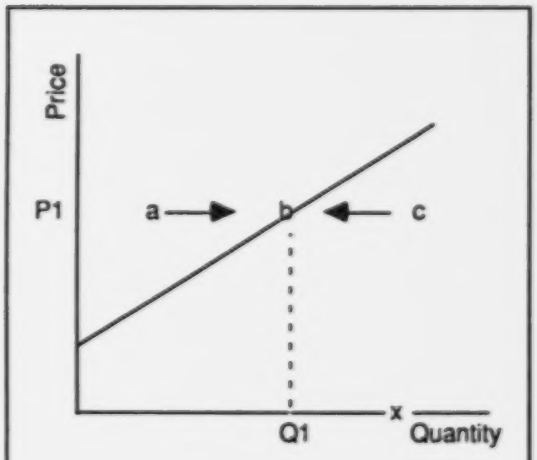


Figure 4.9 The Supply Curve Shows Seller Equilibrium

Given P1, Q1 is the preferred quantity.

A similar analysis holds for the supply curve. If at point a in Figure 7 suppliers find that they could increase profits (or reduce losses) by moving to the right from Q1 to a larger quantity, they are not in equilibrium and they are not on the supply curve but to the left of it. If they find that they could increase profits by cutting production, they are to the right of the supply curve and out of equilibrium. As Figure 9 shows, if price is fixed at P1, sellers will try to adjust toward the point on the supply curve.

It is possible to force a seller to a position to the left of the supply curve. This is the case in which the seller would like to sell more at the given price, but for some reason can not. One reason might be that the buyers will not buy as much as the sellers would like to sell. It is virtually impossible—short of slavery—to force sellers to the right of the supply curve. This is the situation in which sellers are selling more than they want to at the given price. Thus, the supply curve represents a boundary facing the buyers. If buyers could force sellers to the right of the supply curve, they would find it advantageous to force sellers to a position such as x in Figure 9, which represents getting something for nothing.

Sellers prefer higher prices to lower prices. Though all points on the supply curve represent points of equilibrium, not all are equally preferred by sellers.

The above analysis helps explain how an adjustment process takes place in the supply and demand model. If price is originally P1 in Figure 10, only Q1 will be sold even though buyers would like to buy Q2. The difference Q2 - Q1 represents a shortage. The sellers are in equilibrium in this situation, but buyers are not. Some buyers who cannot obtain the product are willing to offer more, and sellers are always willing to accept a higher price. Therefore, the actions of the buyers, as they compete with each other to obtain the amount that is available, drive the price upward in this model toward market equilibrium.

If price is originally at P2 in Figure 11, only Q1 will be sold because this is all that buyers

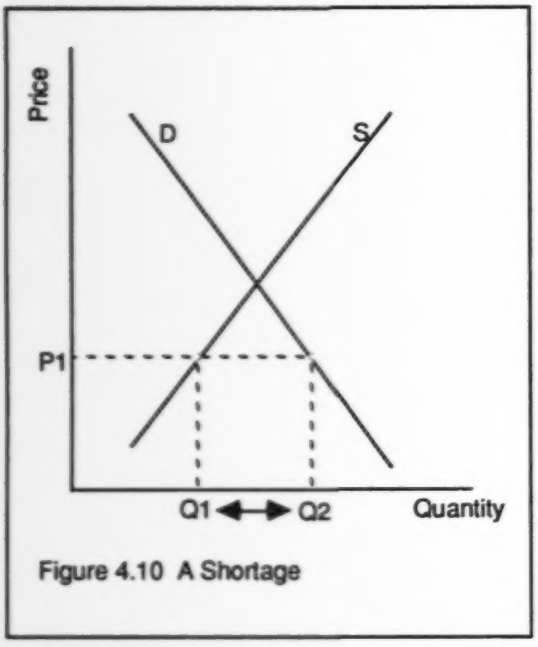


Figure 4.10 A Shortage

will purchase, even though sellers are willing to sell more. The difference Q2 - Q1 is called a surplus. In this situation the buyers are in equilibrium but the sellers are not. Sellers will compete among themselves to get rid of the surplus, and some will be willing to offer their product at a lower price. Buyers are always willing to move down the demand curve, so there is a tendency to move downward toward market equilibrium in Figure 11.

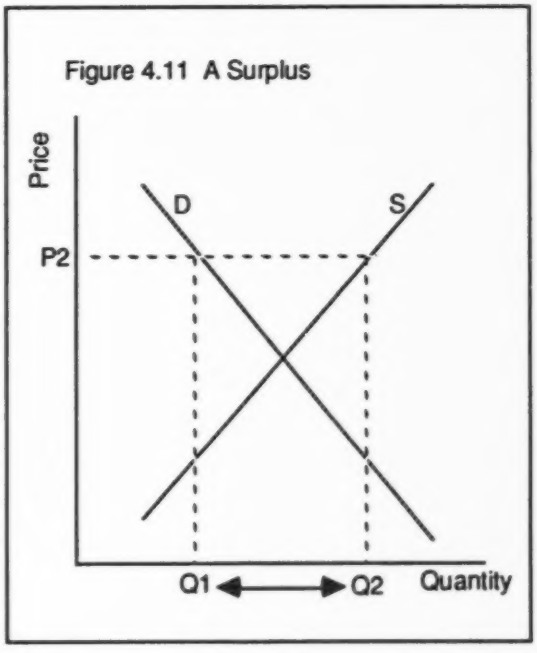
One would expect that if left to itself a market that can be represented by supply and demand would tend to adjust to the point where the supply and demand curves cross. The price at this intersection is called the market-clearing price. There is, however, the possibility that the existence of lags in the adjustment process may make the adjustment more complex than the previous discussion indicates.

Suppose that the price of cattle feed rises sharply. This is a factor which should affect the supply curve of cattle and shift it to the left. The profitability of cattle production is reduced at each possible price, and some producers will drop out of the industry while others will curtail production. Looking at the curves, we see that prices should rise and quantity drop.

But initially prices might drop and quantity rise, which is exactly opposite the prediction from the supply and demand graph. The higher costs of feed will encourage farmers to raise fewer cattle, but as part of that cutback, they will temporarily send more cattle to the slaughter houses. The prediction which supply-demand analysis gives will ultimately be correct, but it will not be correct in the process of adjustment.

More complicated adjustment patterns are possible. Suppose, for example, that higher beef prices shift the demand for pork to the right. Supply and demand analysis says that this should increase pork prices, and at the higher prices, farmers should produce more hogs.

However, hog production takes time, and will only happen if farmers expect the higher prices to continue for a long time. If pork producers do expect the higher prices to last, they may decrease the number of pigs sent to slaughter, further increasing price. A sow can either produce pork or baby pigs, but not both. If farmers expect high prices to last,



they will keep their sows for piglet production.

In six months to a year, the baby pigs will have grown enough to go to market. If enough farmers had expected the high prices to last, they may have produced so many pigs that pork prices will now plunge to a level below that which is considered normal. The new, abnormally low price can then influence decisions which will not affect the price for many months. You should see that, once disturbed, a market with long time lags in production may bounce around for years before it finally finds its way back to equilibrium. If such a market is disturbed often enough, its prices and quantities will never come to rest at equilibrium levels.

Part 2 of this book will generally ignore adjustment problems. Microeconomics assumes that markets clear, that is, they are always in equilibrium. Its analysis begins with the assumption that equilibrium has been reached, and then asks questions about that equilibrium. However, adjustment problems are very important in Part 3. Macroeconomics cannot assume there are no adjustment problems, or else it assumes away one of the problems it wants to explain, unemployment. In fact, much of macroeconomics is about the forces which bump an economy away from equilibrium, and why, once it is away, it has problems in reaching a new equilibrium.

SUMMARY

This chapter introduced you to one of the most common models which economists use, the model of supply and demand. It showed that buyers, basing their behavior on the weighing of costs and benefits, will buy more as the price of a product decreases, and that sellers, also basing their behavior on the weighing of costs and benefits, will usually be expected to sell less as the price of a product decreases. The interaction of buyers and sellers in a market establishes an equilibrium price and quantity which can be illustrated graphically with supply and demand curves.

QUESTIONS

1. A profit-maximizing professor asks her class the maximum they would pay for an A. These are the numbers she gets: $100, $50, $75, $0, $200, $0, $500, $50, $50, $10, $25, $75, $50. Construct a table which shows the demand curve for As in this class.

2. Assume that normal supply and demand curves can represent the American market for beef. As a result of each event below, indicate in which direction the supply and demand curves will move (right or left) and what happens to equilibrium price and quantity.

	SUPPLY	*DEMAND*	*Q*	*P*
A. The price of cattle feed rises.	___	___	___	___
B. People start worrying about the sanitation in meat slaughtering houses.	___	___	___	___
C. A severe winter destroys 5% of the herds.	___	___	___	___
D. The ban on the use of DES (a growth hormone used for cattle) is lifted.	___	___	___	___

E. In an effort to aid farmers, government grants a subsidy of $.05 a pound for beef produced. ___ ___ _ _

F. Government grants farmers a subsidy of $10 per acre of land they own. ___ ___ _ _

G. All foreign beef is excluded from the American market. ___ ___ _ _

H. Per capita income rises. ___ ___ _ _

I. Housewives expect rising beef prices. ___ ___ _ _

J. Food companies improve the taste of their soybean meat substitutes. ___ ___ _ _

K. The price of ham falls. ___ ___ _ _

L. A cheap and perfect substitute for leather is developed. ___ ___ _ _

M. The price of milk decreases and dairy farmers sell their herds. ___ ___ _ _

N. The price of ketchup (a complementary good) rises. ___ ___ _ _

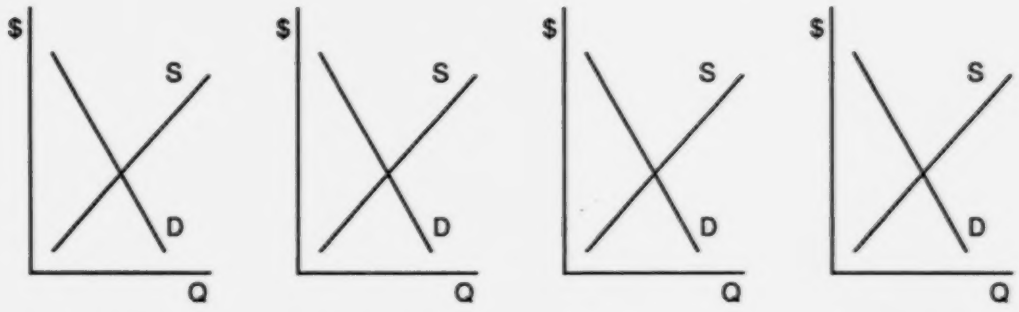
Note: for the last three events, determine the price and quantity which will appear in the market. They may not be equilibrium prices or quantities.

O. The government establishes a price ceiling above equilibrium price. ___ ___ _ _

P. The government establishes a price ceiling below equilibrium price. ___ ___ _ _

Q. The government sets a price floor above equilibrium price. ___ ___ _ _

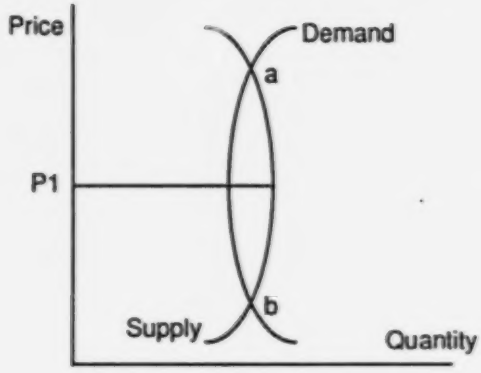
Warning: Several of the items above are slightly ambiguous and the answer you give depends on the assumptions you make.



3. Suppose the markets shown above may be described by supply and demand curves. Show what should happen in each market as a result of a sharp increase in the price of petrochemicals from which synthetic fibers are made. Add a note of explanation to each graph. (Hint: work from left to right and ignore any feedback.)

4. "If the price goes down, the seller will have to sell more to make the same profit. Hence the supply curve should have a negative slope just as the demand curve does." What is wrong with this reasoning? (Hint: What did we assume about the level of profits a firm seeks? According to this quotation, what would happen to profits if a seller sells more at the original, high price?)

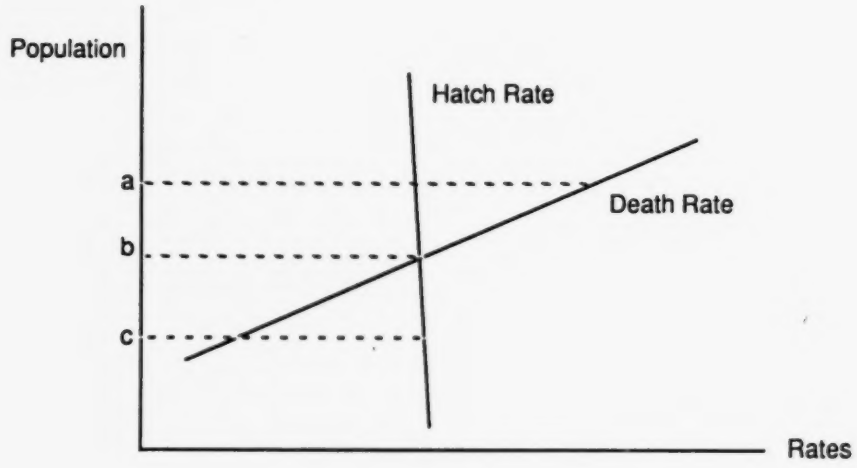
5. Suppose price is at P1 in the figure below. What will the adjustment process cause to happen? Is there any difference between equilibria a and b?



6. Suppose an ecologist is studying the population of the golden-throated song sparrow and he finds the relationships illustrated in the graph below between the hatch and death rates and population, given that existing food supply, level of predation, etc., are fixed. a) What will happen if the population is at level a? At level b? At level c?

b) Show on the graph what will happen if the food supply increases.

c) Explain what will happen on the graph if, due to an increase in the use of pesticides, fewer eggs hatch.



d) Explain what will happen on the graph if the number of predators increases.

e) In what ways do the mechanics of this model resemble the mechanics of the supply and demand model?

7. The law of demand says that as something gets cheaper, people buy more of it and as something gets more expensive, people buy less. Which of the following events would increase the amount of college education people buy?

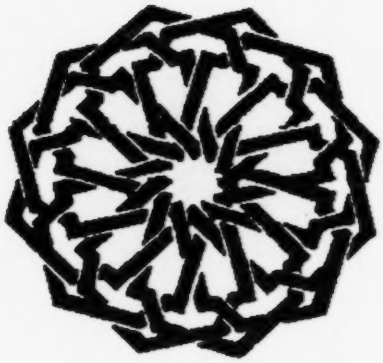
a. tuition rates fall.

b. full-time jobs available to high school graduates decrease.

c. the price of food falls.

d. the price of housing falls.

Costs are whatever must be given up to get something. Which of the following are costs of going to college: tuition and fees, book expenses, entertainment expenses, housing costs, food costs, lost chances of earning income? How much does it cost you to go to college using this definition of cost?



CHAPTER 5

ECONOMIC CATASTROPHES: AN INTRODUCTION TO MACROECONOMICS

After you finish this chapter and work the questions at the end, you should be able to:

Explain how microeconomics differs from macroeconomics in topics and in the way its simplifies its theory.

Define what a recession is.

Explain what a hyperinflation is, and how people change behavior in order to cope with it.

Explain who gains and who loses from inflation or deflation.

Explain what is meant by partial equilibrium analysis.

Sketch what happened to production, unemployment, and prices during the Great Depression.

Since the 1930s economists have split their domain into two parts, into **microeconomics** and **macroeconomics**. The difference between microeconomics and macroeconomics is in the problems with which each is concerned. Microeconomics focuses on the "What?" and "For Whom?" questions. It examines how a society decides to produce the bundle of goods and services it does (the "what" question), and who gets these goods and services (the "for whom" question). It examines how various systems of incentives and ways of making decisions (such as "dollar voting" or various forms of political voting) work to solve the "what" and "for whom" questions. Central in much of this examination is the concept of economic efficiency. Microeconomics asks whether the bundle which a society produces is the bundle which has the highest value to that society, and if it does not, what changes would increase that value.

Macroeconomics deals with topics of inflation and unemployment. This chapter introduces you to macroeconomics by looking at extreme episodes of both inflation and unemployment. It also describes how the methods used in macroeconomics differ from those used in microeconomics.

A CASE OF HYPERINFLATION

In the early 1920s Germany experienced one of the most severe inflations of all time. (Those interested in trivia may enjoy knowing that Hungary had an even worse inflation in 1945 and 1946 and seems to hold the world record for the biggest inflation.) The inflation was not apparent in 1920, but began showing up in 1921. Thereafter it got steadily worse until it came to an abrupt halt at the end of 1923. At its worst in the second half of 1923, prices rose more than fivefold each week.

Some idea of the magnitude of this catastrophe can be seen in Table 1. During 1920 and early in 1921 the signs of inflation were mixed. The price of food was increasing, but the price of dollars in terms of marks (the mark was the name of the German currency) was dropping, and so were the prices of products bought from the United States. However, the signs of inflation were unmistakable in the next year, from mid 1921 to mid 1922. In this period prices increased about sixfold—that is, it took six marks at the end of the period to buy what one mark would have bought at the beginning. But this rapid inflation, greater than any yearly inflation in the history of the United States, was only a prelude for what was to happen.

From the middle of 1922 until the middle of 1923 prices increased by over 100 times. Measured by the price of food, prices were 135 times higher at the end of the period than they were at the beginning. Measured by how many marks it took to buy a dollar, prices were 222 times higher. Yet even this horrid inflation was mild compared to what happened from July to November of 1923, when prices increased by somewhere between a million and a billion times their previous level.

The rapid increase in German inflation can be seen in the postage stamps that were issued during this period. (See Figure 1.) In 1920 the highest valued stamp issued was for four marks. In 1923 the denominations were changing so rapidly that the post office could not design new stamps fast enough and resorted to using old dies and then overprinting them with new values. The highest value reached in 1923 was for 50 billion (50,000,000,000) marks. A great many of these stamps must have been issued and bought, though not necessarily used, because very few of the almost 200 varieties of stamps issued from 1921 to 1923 have more than minimal collector's value. Also, stamps that were postally used during the period have a higher collector's value than stamps which were never used, a pattern that is quite unusual.

Inflation hurts some people but helps others by redistributing wealth and income. Buyers, for example, are hurt by higher prices, but offsetting this is the gain which

TABLE 1
MEASURES OF GERMANY HYPERINFLATION
Percentage Change in Various Measures of Inflation

Dates	Internal Prices	Price of Dollars	Cost of Living*
Feb 1920 to May 1921	4.6%	-37.2%	39.2%
May 1921 to July 1922	634.6%	692.2%	417.9%
July 1922 to June 1923	18094%	22201%	13573%
July 1923 to Nov 20 1923	854,000,000,000%	381,700,000,000%	560,000,000,000%

*food until June 1923, thereafter based on all items. These data were calculated by the Statistical Bureau of the Reich. All data are from *The Economics of Inflation: A Study of Currency Depreciation in Post-War Germany* by Costantino Bresciani-Turroni (Augustus Kelley), pp. 30, 33, 35-6.

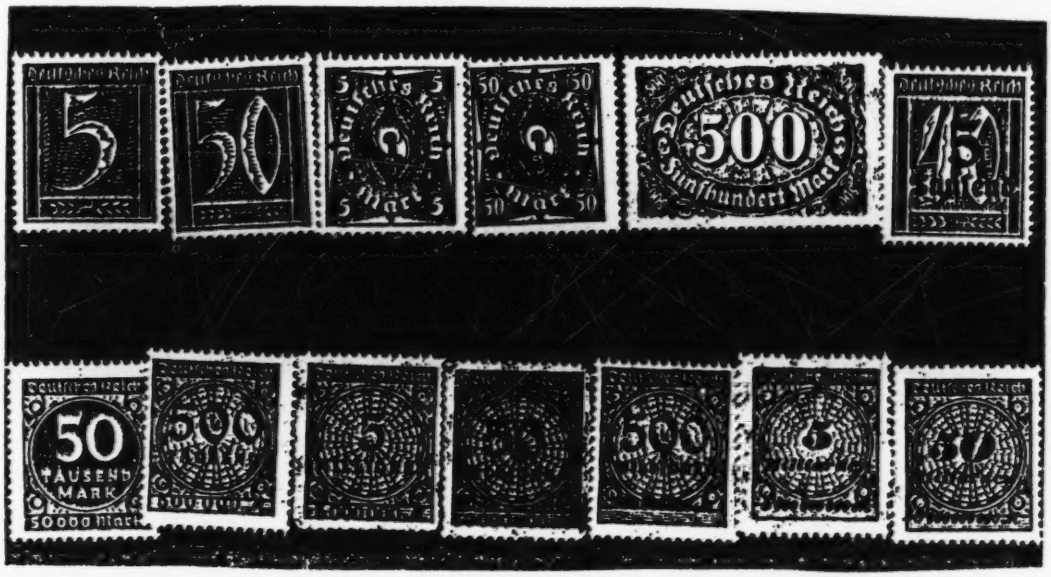
the producers get from the higher prices. People on fixed incomes will suffer, as will creditors, who are owed fixed amounts of money in the future. On the other hand, those paying the fixed incomes will benefit, as will debtors. The German hyperinflation illustrates the redistribution which inflation causes in a dramatic way. It eliminated the value of all life insurance policies and all savings left in banks. When life insurance policies were paid in 1923, the value of the check was usually worth much less than the stamp used to post the letter. The hyperinflation eliminated all debts that existed prior to 1921. For example, the value of German mortgages in 1913 measured in U.S. dollars was about $10 billion; in late 1923 these mortgages were worth only one U.S. penny.

By 1924 the inflation had radically redistributed the wealth of Germany. The segment of society that was hit the hardest seems to have been the middle class. The poor had little wealth to lose. The rich were often able to get their wealth into forms not adversely affected by inflation. Wealth held in foreign bank accounts, gold and precious metals, and land, for example, maintained its value.

When inflation redistributes wealth and income, some gain and others lose. If this were the only effect of inflation, one could argue that it is not a serious problem. Since for every loser, there is a winner, society as a whole may break even (if this redistribution is not seen as being too "unfair"). However, inflation also makes ordinary decisions more difficult to make, and it causes people to change their behavior. The changes in behavior, which will cause social losses, are again dramatically illustrated in a hyperinflation.

Coping with a situation in which prices could double in a day meant changes in the way people organized their financial affairs. Wages were paid daily or several times a day, and the whole family would immediately go out and spend the money before it lost value. In his book *The Black Obelisk*, a novel set in 1923, Erich Maria Remarque describes this

Figure 17.1 German postage Stamps, 1921-23. Each stamp is worth ten times the value of the stamp to its left.



practice:

> "Workmen are given their pay twice a day now—in the morning and in the afternoon, with a recess of a half-hour each time so that they can rush out and buy things—for if they waited a few hours the value of their money would drop so far that their children would not get half enough food to feel satisfied."[1]

Getting rid of money was the key to financial survival since it lost its value so quickly.

Merchants eventually found that they could not mark up prices as fast as they were rising.

> "So they left the price marks as they were and posted (hourly) a new multiplication factor. The actual price marked on the goods had to be multiplied by this factor to determine the price which had to be paid for the goods. Every hour the merchant would call up the bank and receive the latest quotation upon the dollar. He would then alter his multiplication factor to suit and would perhaps add a bit in anticipation of the next quotation. Banks had whole batteries of telephone boys who answered each call as follows: '100 milliarden, bitte sehr, guten Tag.' Which meant: 'The present quotation on the dollar is 100 billion marks, thank you, good day.'"[2]

The great inflation led to a large waste of society's resources. Just coping with the rapid change required resources—the extra bank clerks that Bopp mentions are but one example. Talented people no longer tried to earn money by productive activity, but sought ways to stay ahead of inflation, an activity unlikely to have any social benefits. Fortunes were made by those who speculated on the continued worsening of inflation. People who borrowed heavily almost always did well.

People dislike inflation because it redistributes in ways they consider unfair, be-

[1] translated by Denver Lindley (New York: Harcourt, Brace-world Inc, 1957) p. 262.

[2] Karl R. Bopp, "Hjalmar Schacht: Central Banker," *The University of Missouri Studies*, Vol XIV, No. 1, Jan. 1, 1939 p. 13.

cause it forces them to take actions to protect themselves, and because it makes decisions more difficult to make. Decisions to buy, sell or invest are based on a person's knowledge of what normal prices are, and this knowledge of normal prices is based on remembering past prices. With inflation, a person must remember not only past prices, but also the dates of those past prices, and then must try to compute what their present equivalents would be. Because our mental capacity to handle large amounts of information is limited, and because inflation requires us to handle more information in order to make decisions, inflation, even when it is perfectly predicted, reduces our ability to make good decisions. People like stable prices because they minimize the cost of making economic decisions.

The German hyperinflation came to an abrupt end in November of 1923. The man who received credit for this achievement was named Hjalmar Schacht. In his autobiography he mentions a little poem that indicated his popularity among common folk:

> "Wer hat die Mark stabil gemacht,
> Das war allein der Doktor Schacht."

This can be loosely translated as:

> Who could make the mark stable?
> Only Hjalmar Schacht was able.

He was less popular with those who borrowed heavily on the assumption that prices would continue to rise. Stabilization led to large losses for them, and in some cases unmade huge fortunes that inflation had built.

The German hyperinflation is an example of a major economic catastrophe, one that cries out for explanation. Did some defect in the economic system cause this disaster? Was it accidental, due to an unlikely combination of circumstances? Was it due to error on the part of government policy makers? Can a society take steps to insure that a similar disaster does not happen to it? These are important questions, questions which economists have spent years studying. However, the German hyperinflation is an example of only one type of economic disaster. Another type was illustrated in the United States during the 1930s.

A CASE OF UNEMPLOYMENT

The decade of the 1930s saw the Great Depression in the United States and many other countries. During this decade large numbers of people lived in poverty, desperately in need of more food, clothing, and shelter. Yet the resources which could produce that food, clothing, and shelter were sitting idle, producing nothing.

At the worst point of the Great Depression, in 1933, one in four Americans who wanted to work was unable to find a job. Further, it was not until 1941, when World War II was underway, that the official unemployment rate finally fell below 10%. This massive wave of unemployment hit before a food stamp program and unemployment insurance existed. There were few government programs designed to help the poor or those in temporary difficulty. Further, in most families wives did not work, so if the husband lost his job, all income for that household stopped. An equivalent rate of unemployment today would cause less economic hardship because of the variety of programs (often inspired by the Great Depression) which cushion unemployment and poverty.

Many people date the beginning of the Depression at October 24, 1929, Black Thursday, the day the stock market crashed. This was indeed a traumatic day for those who owned stock as sales volume broke all records. But the decline in overall stock prices was only about 2.5%, from 261.97 to 255.39 as measured by the *New York Times* index of 50 stocks. Most of the decline still laid in the future; the market hit bottom on July 7 of 1932 when the *Times* index was only 33.98, a decline of over 89% from its high of 311.90 of September 19, 1929.

However, economists date the Depression

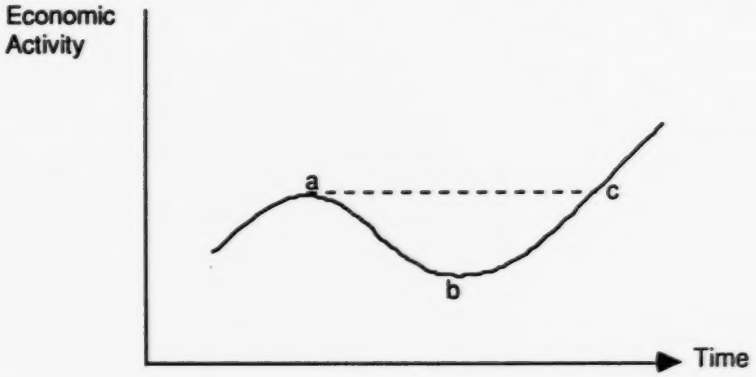


Figure 5.2 Recessions occur when economic activity falls.

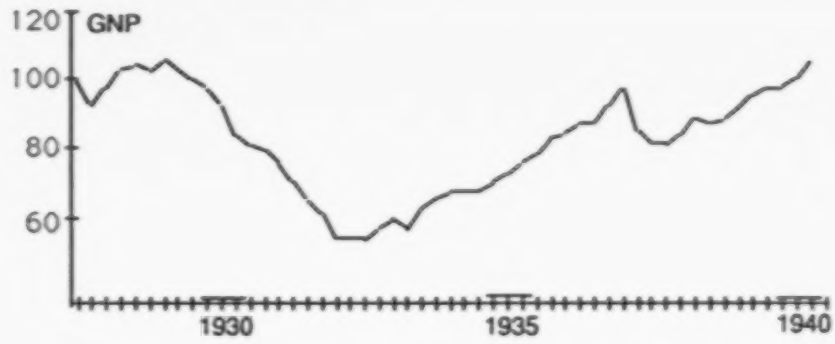
somewhat differently. First, they usually make a distinction between **recession** and depression, and they use the concept of recession much more than they use the concept of depression. A recession is a period in which economic activity is receding or falling, while a depression is a period in which it is depressed below some level. In Figure 2, which shows a path of economic activity through time, the period from *a* to *b* is the period of recession. At time *a* the economic activity is peaking, and there is a trough at time *b*. After *b* the economy is in a recovery or expansion stage. Which period is best called a depression is less clear since one must first decide which level provides the measure of normalcy. One could consider the period from *a* to *c* the depression because after *c* the economy is above its previous high point, but there are other options that make as much sense.

The period which is called the Great Depression contained two periods of recession. The first began in August of 1929 (two months before the stock market crash) and ended in March of 1933. (These dates have been chosen by the National Bureau of Economic Research, a nonprofit organization which sponsors a great deal of economic research. They are based on the analysis of a large number of economic time series, and do contain some subjective elements.) In the first recession the value of goods and services that the economy produced fell by about 42% (but only by 36% once the effects of price changes are eliminated). The recovery in the four years that followed was slow and not completed by the time the second recession began. In this recession lasting 13 months from May 1937 until June 1938, output fell by 9% (but only 6% when the effects of changes of prices are eliminated).[3]

Figures 3, 4, and 5 show the effects of these two recessions on output (Gross National Product or GNP), unemployment, and prices. (The way these data were collected will be the topic of the next chapter.) Note that prices *fell* considerably from 1929 to 1933, but not afterwards despite the very large levels of unemployed resources. As a result of this fall, those who kept their jobs and received the same pay in 1933 as in 1929 were much better off in 1933 than they were

[3] Data are from Geoffrey H. Moore, *Business Cycles, Inflation, and Forecasting*, (Cambridge, Mass: Ballinger, 1980), page 440. Other sources will give slightly different numbers, a point discussed in the next chapter.

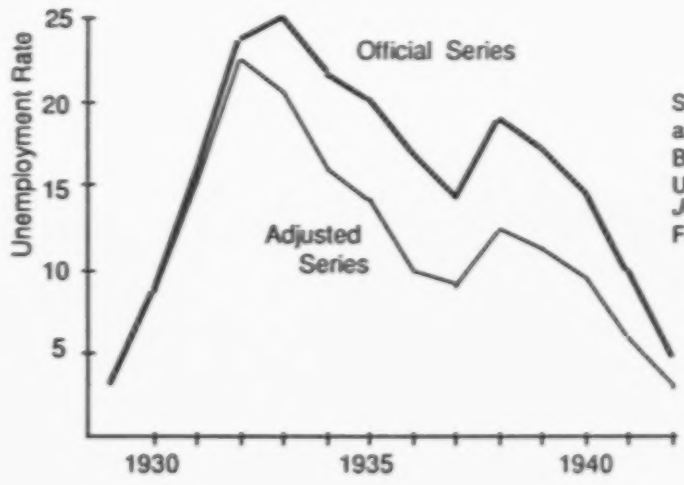
Figure 5.3 U.S. GNP, 1928-1940 (quarterly totals at annual rates)



Source: Derived from Table 16.1 *Business Cycle Indicators*, Vol II, Geoffrey H. Moore, Ed. (Princeton, 1961), p. 135.

in 1929. Another group which should have benefitted from the decline in prices was creditors because the real value of what was owed to them increased as prices fell. However, in many cases the debtor could not pay because of the poor business conditions, so not all creditors actually benefitted from the deflation.

People perceive the 1930s as a period in which business failures were very high, and they were when one compares them to what happened in the 1940s and 1950s. During the years 1930 to 1933, the annual failure rate was 127 for every 10,000 businesses. In contrast, failure rates in the 1950s were between 40 and 50, and for the 1940s they



Source: Michael R. Darby, "Three-and-a-half Million Employees Have Been Mislaid, Or an Explanation of Unemployment, 1934-1941," *Journal of Political Economy*, February, 1976, p. 8.

Figure 5.4 U.S. Unemployment Rate, 1929-1942

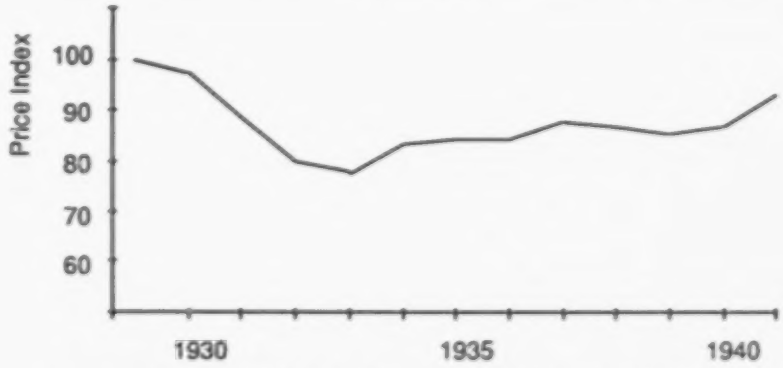
TABLE 2
NUMBERS OF BANKS AND BANK SUSPENSIONS

YEAR	NUMBER AS OF 12-31	SUSPENSIONS
1929	24,633	659
1930	22,773	1350
1931	19,970	2293
1932	18,397	1453
1933	15,015	4000
1934	16,096	57

Data are from Table V 20-30 in *Historical Statistics of The United States: Colonial Times to 1970*, 1975, p. 912.

averaged only 23. However, during the years 1925 to 1929, a period usually considered prosperous, the failure rate averaged 104.

There was one segment of business which was unusually hard hit during the Depression, the banking industry. Table 2 shows the number of banks each year and the number of bank suspensions. A bank suspension indicates that the bank closed during the year, but it does not mean that the bank failed. Some banks closed only temporarily. Nonetheless, the total number of banks fell by about one third during five years, either through merger, failure, or voluntary liquidation. This process was not invisible to the public. The most dramatic banking crisis in the history of the United States took place in early 1933. In one of his first acts as president, Franklin Roosevelt declared a banking holiday and, as a result, no banks were open



Source: *Historical Statistics of The United States*, part 1, U.S. Bureau of Census, 1975, p. 197.

Figure 5.5 U.S. GNP Deflator, 1929-1941 (1929=100)

from Monday, March 6 to Monday, March 13. The drastic reduction in bank suspensions in 1934 reflects both new policies and the enactment of legislation to insure banks.

The high unemployment rates of the 1930s made those who had jobs both thankful that they had jobs and fearful that they could lose them. Those who could not find jobs often took to the roads—thousands of men regularly rode the rails. The numbers in skid rows increased greatly, and other homeless set up homes in shantytowns throughout the nation that became known as "Hoovervilles." Because the Depression caused so much suffering, it is not surprising that it caused major changes in the political structure in the United States.

From the Civil War until the Depression, the Republican party was the dominant political party—it generally controlled the House of Representatives, the U.S. Senate, and the Presidency. In the elections of 1930, the Democrats took control of the House of Representatives, and after the 1936 elections they outnumbered the Republicans 331 to 89. Only once since 1930 have the Republicans regained a majority in the House. The Republicans lost control of the Senate in 1932, and only in six of the next fifty years were they a majority in that body. In the same year of 1932, Franklin Roosevelt was overwhelmingly elected, defeating Herbert Hoover with a total of 22.8 million votes to 15.8 million. Along with the change in dominant political party has come a change in the responsibilities Americans expect from government. Only a limited understanding of American politics is possible without understanding the effects of this period; we still live in the shadow of the Depression.

Finally, the Depression was more than an American affair. Many other nations, though not all, experienced a similar decline, though the severity and timing differed from country to country. For example, Britain hit its trough in the third quarter of 1932, while France did not reach its low point until April of 1935.

The questions that the Great Depression raises are similar to those which the Great Inflation raised. What caused this disaster? Was it caused by some defect in the economic system of the United States or the world? Was it caused by some accidental occurrence of unlikely events? Was the government in any way responsible for it? Can a society take steps to insure that such an event does not happen to it? Why was the Depression international in scope? Finally, is there any relation between what happened in Germany in 1921-1923 and what happened in the United States in 1929-1940?

MICROECONOMICS AND MACROECONOMICS

The two stories of economic disaster just discussed have greatly interested economists during the past fifty years because they are extreme cases of common problems. In the United States, for example, the level of unemployment has fluctuated, with annual rates ranging from 3.0% to 6.8% in the 1950s, from 3.5% to 6.7% in the 1960s, and from 4.8% to 8.3% in the 1970s. Similarly, the rate of inflation has sometimes been uncomfortably high. During the 1950s prices (as measured by the Consumer Price Index which the next chapter discusses) rose by 23%, during the 1960s they increased by 31%, and during the 1970s they more than doubled, rising by 112%. Though these numbers are all small compared to what happened in the Great Inflation and the Great Depression, and also compared to what has happened in other countries in the past 50 years, they indicate the persistence of problems in economic performance of Western nations.

Though macroeconomic problems are visible and dramatic, and though they tend to be the economic problems which most often appear in newspaper headlines, they may not be the most serious economic problems. A strong case can be made that problems involving economic growth and development are more important. Indeed, economics began when Adam Smith set out to

explain how a nation becomes wealthy, or in today's terms, how it develops economically.

Despite the importance of development, introductory texts hardly discuss it. One reason may be that industrialized nations, where this problem is no longer seen as very serious, are home to most economists. Perhaps a more important reason, however, is that the analytical tools of economics have problems dealing with issues of development.

One reason economic theory has problems with development is that individual creativity is a key ingredient in development. Someone must see opportunities and decide how to take advantage of them. Creativity is by its nature almost impossible to incorporate in theories. Theories try to explain regularities, but the essence of creativity is that it produces something new, an irregularity.

Economics should have an easier time looking at the conditions which generate or support economic development. The twentieth century has had some interesting experiments. There are sharp contrasts between economic conditions in South Korea and North Korea, between East Germany and West Germany, between mainland China and Taiwan or Hong Kong. Though one may attribute these differences to a variety of factors, one factor that explains a great deal of the disparity is the structures of incentives which governments establish.

Those governments which have prohibited, penalized, or severely curtailed business entrepreneurship (a form of creativity) have generally had much poorer results than those nations which have not discouraged entrepreneurship. When business entrepreneurship is eliminated, citizens are unable to substantially improve their lot through economic activity, and either must be content with their station in life or turn to other avenues for improvement, such as the military, politics, or religion. Sometimes nations discourage business entrepreneurship under the banner of socialism, but often they do so as a way of protecting existing businessmen and others of wealth. One could argue that the suffering worldwide caused by government incentives which discourage economic development far exceed those which inflation and recessionary unemployment cause.

However, economic development is more than a problem of discovering some ideal set of government incentives. The situations listed in the previous paragraph show how different incentives affect those with a similar culture. In other countries we see that different cultural groups fare very differently when they face similar incentives coming from government policy. For example, in the United States people of Chinese and Japanese ancestry have outperformed those of European ancestry despite considerable obstacles placed in their way. Economics lacks tools to examine cultural differences and distinctions. The role that culture plays in economic development has been a barrier to good theories of that development.

The tools of economic analysis have worked better in the areas of microeconomics and macroeconomics. Both microeconomics and macroeconomics start with the assumption that individuals are self- interested and make decisions on the basis of costs and benefits. (This statement was not true thirty years ago when microeconomics and macroeconomics were seen as two separate branches of economics. Since then much effort has gone into uniting them by giving macroeconomics a foundation in microeconomics.) But the different topics they address require different simplifying assumptions. As a result, macroeconomic theory appears to be somewhat different from microeconomic theory.

To understand the methods used in both, one must first realize that theory is a creation of the human mind. Theory is our attempt to impose order on the world around us. Theory is like a map. A good map shows how pieces of geography fit together, but it omits large amounts of detail. It simplifies the world so that our mind can use the information it contains.

Economic reality is more complex than any human mind can completely understand. To be useful, economic theory must give us a simplified picture of this reality. In

microeconomics the usual way to simplify is to use **partial equilibrium analysis.** Partial equilibrium analysis assumes that we can look at part of the system in isolation, ignoring the rest. Strictly speaking, this assumption is rarely if ever true. What happens to the apple market may affect the orange market, and these effects may in turn come back to affect the apple market. But indirect effects of this sort are often small enough to ignore, especially when one does not worry about the adjustment process. Microeconomics usually begins with the assumption that the economy is at equilibrium, that is, all markets clear. It then investigates properties of this equilibrium.

In macroeconomics, however, these indirect effects are interesting and important because economists have found that problems visible in one set of markets very often have their origin in another set. The human mind, however, cannot work through the interactions of the millions of markets that make up a real economy. If the economy had only three of four markets, the patterns of interaction would be simple enough to understand. Economists create this simple economy of only a few markets by combining together, or aggregating, many thousands or millions of markets which microeconomics looks at separately.

Microeconomics also aggregates, but not in the drastic way macroeconomics does. Though the prefix *micro* suggests that microeconomics deals with small units, such as individual consumers and sellers, it does not. It does discuss how *idealized* individuals act, but it does this so it can use the results to predict what groups will do. And in discussing what groups do, it aggregates. Thus economics does not predict what Adrienne Hrycyk will do if the price of apples increases by 10% due to a bad harvest. It does predict that consumers as a group will buy fewer apples. Individual behavior involves many variables, and price may not be the most important. When groups become large enough, the special circumstances of each individual tend to cancel out, and the role of price dominates all other factors.

However, macroeconomics does not just lump together all the buyers or sellers of one product: it lumps together completely separate markets. It combines millions of markets into a few—often just two, three, or four. In a sense economists replace apples, oranges, cars, and haircuts with a composite good and discuss the market for goods and services, and they replace accountants, lawyers, masons, and waitresses with a composite item and discuss the labor market. This procedure may seem extreme, but economic measurements discussed in the next chapter, including such common ones as rates of inflation and unemployment, make sense only if this procedure is accepted.

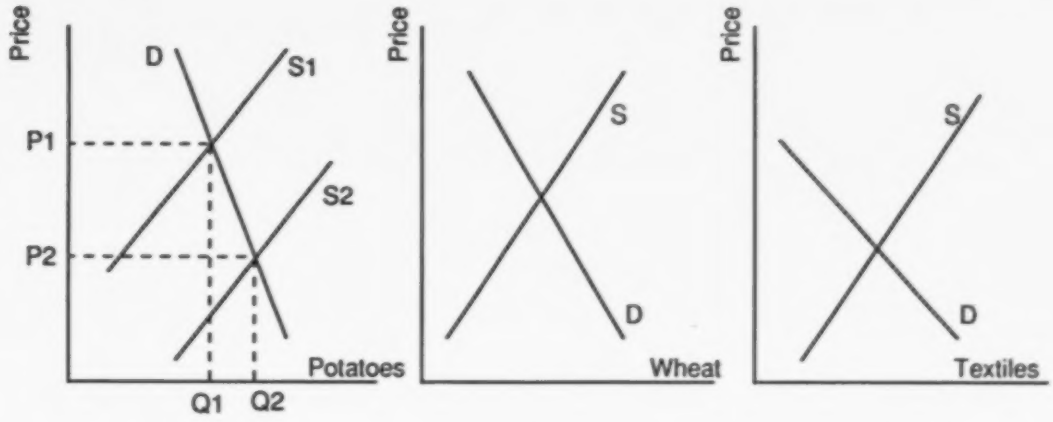
A recital of problems does not tell us anything about their causes. To examine causes, we need theory to interpret the facts. Unfortunately, in macroeconomics there remains a substantial amount of disagreement among economists about what theory organizes the facts best. Topics of macroeconomics are usually more controversial than topics in microeconomics. Before looking at any theory, however, we will take a look in the next chapter at how measurements can be made in aggregated markets.

SUMMARY

This chapter looked at historical cases of serious macroeconomic problems. It looked at some of the effects of hyperinflation in Germany after the First World War, and at the effects of massive unemployment in the United States during the 1930s. It concluded with a short explanation of how the techniques of macroeconomics differ from those of microeconomics.

QUESTIONS

1. To illustrate partial equilibrium analysis, consider the potato market in a small, hypothetical country. In year 1 the harvest is average and yields supply curve S1. As a result, the market clearing price is at P1, and the amount traded is Q1. Now suppose that in year 2 there is a very good harvest. As a result, the supply curve shifts to the right, to S2, the price falls to P2, and output increases to Q2. The story ends here in partial equilibrium analysis.



a) However, suppose that wheat is a good substitute for potatoes in the diets of the people. i) What will happen to the wheat market as a result of the drop in price of potatoes? ii) Will the price of wheat fall or rise? iii) If the price of wheat changes, this in turn should have effects on the market for potatoes. Show what effects this change will have on the supply and demand graphs above.

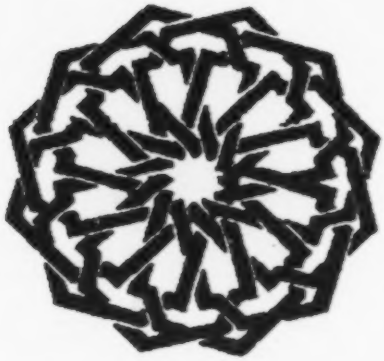
b) If the demand curve for potatoes is steep, as it is in the graph, the extra potatoes which farmers harvest will drive down the price so much that the incomes of the farmers will decrease. Suppose that both potato farmers and wheat growers are important buyers of textiles, and that in turn the textile producers are major consumers of potatoes. i) What will the changes in farm income do to the supply and demand curves in the textile market? ii) What will happen to incomes in the textile industry as a result? iii) What changes in the potato market will occur as a result of changes in incomes in the textile industry? Show by drawing in the appropriate changes in the graphs above. (Comment: When indirect effects are big, it can be very dangerous to try to unravel them with partial equilibrium analysis.)

2. Prices transmit much of the information on which decisions are based in a price system, and when prices are constantly changing as they do during inflation, the information which they contain becomes more difficult to use. The human mind can only coordinate and analyze a limited amount of information. When there is inflation, one must include not only the price of an item but also the date of that price in the calculations which lead to a decision. By increasing the information and the calculation needed to make good decisions, inflation will make good decisions more difficult to make. If there are fewer good decisions, the performance of the economy will suffer.

a) Assume that there is no inflation. Ingrid G has observed these prices for a type of canned fruit over the past four months: $.49, $.55, $.45, and $.52. She now sees a price of $.44. At this price is the fruit a good buy? Explain.

b) Assume that the price level is rising at 5% a month and that everyone knows this. Ingrid G has seen these prices over the past four months: $.49, $.58, $.50, and $.60. She now sees a price of $.53 for this product. At this price is the product a good buy? Explain how you get your answer.

c) Some economists have argued that if inflation is perfectly foreseen, there are virtually no costs to inflation. Will Ingrid G agree with them?



CHAPTER 6

MEASURING ECONOMIC AGGREGATES

After you finish this chapter and work the questions at the end, you should be able to:

Outline how the U.S. unemployment rate is computed.

If given a table goods and weights with prices at two or more time periods, compute a price index.

Describe what is meant by the term "seasonally adjusted."

Distinguish between price level and price structure; between real and nominal measurements.

List some of the problems in the way unemployment, inflation, and total production are measured in the U.S.

If given current-dollar GNP and the price index, compute real GNP.

Explain what the leading indicators are.

If the drastic aggregation of macroeconomics seems rather strange, think about what a discussion of unemployment or inflation means. When we talk about the country's unemployment rate, we are lumping together all people who work, which means we are talking about an aggregated labor market. When we talk about inflation, we are talking about what happens to prices overall, or the price level, which only makes sense if we are making reference to an aggregated market for goods and services. We also refer to aggregated markets when we talk about what is happening to the interest rate, or to wages, or to output.

This chapter examines how the government in the United States measures the three most commonly-used concepts based on aggregated markets: the unemployment rate, the rate of inflation, and gross national product. It will explain the purpose of each measurement, how it is computed, and what its main weaknesses are.

THE UNEMPLOYMENT RATE

The unemployment rate is a widely watched rate, one which the news media report prominently. It gets the attention that it does because a high rate is seen as a symptom of a malfunction in the economic system. Some people who are out of work are in financial distress, and thus one can expect that as the unemployment rate rises, the number of persons in financial distress rises as well. Most people consider a properly functioning economic system as one that has relatively few people in financial distress.

To measure the unemployment rate, the Department of Labor surveys 60,000 homes each month. Each household must answer a series of questions, and from these the breakdown in Table 1 is derived. Excluded from any consideration in determining employment-unemployment status are all those under 16 years of age and those in penal or mental institutions, sanatoriums, and homes for the infirm, aged, or needy. People are considered not in the labor force if they are not working for pay and have no interest in finding a job. Examples are retired persons, some housewives and students, and disabled persons. People are considered employed if they work for pay any time in the week which includes the 12th day of the month, or if they worked unpaid fifteen hours or more in a family-operated business, or if they were temporarily absent from a regular job because of illness, vacation, industrial dispute, or similar reason. People are considered unemployed if they do not work during the week containing the 12th day of the month, are available for work (except for temporary illness), and have looked for jobs within the preceding four weeks. Also considered as unemployed are those who do not look for jobs because they are on layoff or because they are waiting to start a new job within thirty days.

The **unemployment rate** is found by dividing the total number of unemployed by the labor force. The result is then **seasonally adjusted**. Seasonal adjustment is a procedure that many statistical series undergo. It eliminates movements that occur each year in a seasonal pattern. Thus each spring when school lets out there is a flood of new job seekers, and each fall as school resumes there is a reduction in those looking for work and who have work. If this regular seasonal variation is not eliminated, the numbers will suggest that the economy is having difficulty each spring, and that it recovers each fall.

The unemployment data have a number of problems and must be used with caution. Some people are on borders of the categories listed in Table 1, and deciding which category they belong in is a bit arbitrary. For example, the data count as employed all people who are working part time but who would like to work full time. Since these people represent unused labor effort that is available, the unemployment rate understates the extent of unemployed resources in the economy.

Another problem that causes the unemployment rate to understate the extent of unemployed resources is the "discouraged

TABLE 1
EMPLOYMENT STATUS OF THE NONINSTITUTIONAL POPULATION 16 YEARS AND OVER, 1982
(numbers in thousands)

Noninstitutional Population	173,939
Not in Labor Force	62,067
Labor Force	111,872
Employed	101,194
Unemployed	10,578
Unemployment Rate	9.5%

(Source: *Monthly Labor Review*, December 1983, p. 65)

worker" effect. If someone wants to work, but becomes convinced that there are no jobs available, then that person will not make an effort to find work and will be counted as "not in the labor force." Since there will be more discouraged workers the more severe the recession, this factor will tend to dampen the fluctuations in the unemployment rate.

Both part-time workers wanting full-time work and discouraged workers tend to make the unemployment rate lower than it would otherwise be. Working the other way, to increase the unemployment rate above what it would otherwise be, are government payments made to people only if they are out of work but looking for work. Unemployment compensation stops if a person announces that he no longer wants to find a job. Thus even if a person does not want to find another job, he still may make the trip to the unemployment office because in effect the government pays him several hundred dollars to make that trip. The principle involved here is the one of *moral hazard*. Economists have argued that the more generous unemployment compensation payments of the 1970s added about one and one half percent to the normal rate of unemployment compared to the 1950s and 1960s.

A fourth problem of interpreting unemployment numbers and of comparing unemployment during one year to unemployment during another is that changes in the age structure of the population can affect the unemployment rate. There are four sources of unemployment: people enter the labor force, they reenter after temporarily dropping out, they quit jobs, and they are fired or laid off from jobs. Young people seeking their first job will of course undergo a period of unemployment, but young people are also more likely than older workers to switch jobs—which may involve a period of unemployment—and to shift in and out of the labor force as they choose between work and education. As a result, young people have higher rates of unemployment than do those over the age of 25. If the percentage of young people in the labor force rises, one should expect the overall unemployment rate to rise as well. This percentage did rise in the 1970s as a result of the post-World-War-II baby boom. It is a reason that unemployment rates were higher in the 1970s than in the 1960s.

The difficulties in measuring unemployment can also be illustrated with a couple of examples. In 1983 the Labor Department began to issue a second unemployment rate. The new rate counted as employed members of armed forces stationed in the U.S. The old statistic had excluded them from the labor

TABLE 2
COMPUTING A PRICE INDEX

	AMOUNT	PRICE YEAR 1	PRICE YEAR 2	PRICE YEAR 3
HAMBURGERS	3	.75	.70	.90
COLAS	8 CANS	.25	.30	.30
GASOLINE	1 GALLON	.75	1.00	.90
COST OF THE MARKET BASKET		5.00	5.50	6.00
PRICE INDEX		100.00	110.00	120.00

force. The reason for the change was that "with the change to a volunteer system, military employment is not substantially different from civilian employment."[1] Including those in the armed forces as employed reduces unemployment rates by several tenths of a percent.

The question of who is unemployed has much larger implications for the unemployment rates of the 1930s. The official Bureau of Labor Statistics (BLS) figures counted as *unemployed* all those in various government emergency work programs, such as the Civilian Conservation Corps, the Civil Works Administration, and the Works Progress Administration. In 1938 these programs "employed" 3.5 million workers. If these workers had been counted as employed, as they would be under the present way the BLS measures employment status, the unemployment rates from 1933 until 1942 would have been substantially lower. The comparison of the official and "corrected" statistics is shown in Figure 4 of the previous chapter.

[1] *Monthly Labor Review*, Feb. 1983, p. 2.

INFLATION

Inflation refers to an increase in the general level of prices, and deflation refers to a decrease in the general level of prices. One way to look at inflation is to see that it involves increases in prices. Another way is to see that it involves a decrease in the value of money. To say that prices have gone up means that a given number of dollars buys less, or that the value of money has gone down. In an economy that has no money, and in which all exchange is in the form of barter, there could be no inflation.

People consider the rate of inflation important because it affects their planning. They will spend money differently if they expect a 20% annual price increase than if they expect stable prices. For example, if prices are declining, holding inventories is expensive, and sellers will try to minimize inventories. The price at which people borrow and lend funds will also depend heavily on what they expect to happen to prices.

The Department of Labor provides the main measure of inflation, the **Consumer Price Index** or **CPI**. The CPI is a simple and common-sense way to measure inflation. The Labor Department has surveyed the purchasing patterns of consumers to determine a group of almost 400 items which

buyers typically use. This group of items makes up a "market basket." Each month a host of price surveyors checks on the prices of these items in cities across America. These results are then used to compute what the market basket costs compared to what it cost in a base period.

A hypothetical example makes this procedure clear. Suppose a representative market basket of weekly expenditures of teenagers is three hamburgers, eight colas, and one gallon of gasoline. (Of course this is much too small a basket to be realistic, but this example illustrates the procedure.) With the prices of year 1 shown in Table 2, the cost of the market basket is $5.00. In year 2 two prices have risen and one has declined. Yet one can say that on the whole the price level has risen because the cost of the market basket has risen to $5.50. This is an increase of 10% (50/500 = 10%). From year 2 to year 3 prices change again, and the cost of the market basket goes up by another $.50. In year 3 the price level is 20% higher than it was in year 1 ([600 - 500]/500 = 20%), and 9.1% higher than in year 2 ([600 - 550]/550 = 9.1%).

To compute the price index, the cost of the market basket in any period is divided by the cost of the market basket in the base period, and the result is multiplied by 100. In Table 2, year 1 is the base year. The price index for year 3 is:

$(P_3/P_b) \times 100 = (6.00/5.00) \times 100 = 120.00$

The price index tries to give in one number a general picture of what is happening to a great many numbers. As the example shows, some prices may actually be declining while the price index is rising. These prices were not ignored by the price index; rather their contribution was less important to the overall result than the contribution of items whose prices rose.

An important use of a price index is to measure what happens to the purchasing power of income. For example, suppose that a student gets an allowance of $10.00 in year 1, $10.00 in year 2, and $11.00 in year 3. What happens to her ability to buy goods if Table 2 measures her cost of living? To answer this, we can compute how many market baskets she could buy with her income. She can buy two market baskets in the first year, only 1.82 baskets in the second, and 1.83 in the third. From these numbers we can see that her ability to buy goods declined from year 1 to year 2, and then rose very slightly from year 2 to year 3.

An alternative way to measure changes in purchasing power, the one economists use, is to divide her income in each year by the price index of that year and then multiply by 100. This procedure gives us $10.00 for the first year, $9.09 for the second, and $9.17 for the third. This computation gives us *real* income. It says that the $11.00 in the third year bought only as much as $9.17 would have bought in the first year. An income of $9.17 with the prices of the first year had the same purchasing power as $11.00 with prices of the third year. Again, we can see that her ability to buy goods declined sharply from the first year to the second, and then rose slightly from the second to the third.

The construction of a number of other indexes uses the method illustrated in Table 2. The Dow Jones Industrial Average, which many people watch to learn about what the stock market is doing, uses a market basket of 30 stocks. (Notice that *the* stock market is an aggregated market made up of the markets for hundreds of individual stocks.) Other widely-reported indexes include the Index of Producer Prices (which used to be called the Wholesale Price Index) and the Index of Leading Economic Indicators, (both published by the Commerce Department) and the Index of Industrial Production (published by the Federal Reserve System).

There are problems with any attempt to measure in one simple number what is the overall movement in millions of prices. First, the consumer price index is based only on a small fraction of the many goods and services that are available. If a person's buying habits differ substantially from the market basket on which the index is based, that person may experience a very different change in the cost of living than what the CPI shows. To repre-

TABLE 3
WHICH MARKET BASKET?

	PERIOD 1		PERIOD 2	
	Amt.	*Price*	*Amt.*	*Price*
Apples	10	$.20	8	$.25
Oranges	9	$.25	11	$.21

sent this problem in terms of Table 2, consider a person who never eats hamburgers, drinks beer rather than soft drinks, and does not own a car. A price index built on the buying pattern of this person might be totally different.

This question of buying patterns has practical importance when wages and government benefits are indexed (that is, tied to) the rate of inflation that the CPI measures. For example, social security payments are tied to the CPI. When the CPI rises, so do social security checks (though the adjustment is not made each month). Retired people probably have considerably different buying patterns than the rest of the population, and thus their rate of inflation may be greater or less than what the CPI measures. If it is less than what the CPI measures, retired people on average benefit from inflation, and if it is greater than what the CPI measures, they suffer.

Changes in the quality of products are difficult to incorporate into the CPI. If a product becomes better with time and the price also rises, how much of the change in price is due to the improved quality? Changes in quality are rather common over long periods of time. The automobile of the 1960s was very different from that of the 1940s, and the tremendous improvement of electronics products—televisions, audio equipment, and computers—has changed the way we live and work. The Commerce Department tries to make adjustments for quality changes, but by their very nature such adjustments are in part subjective.

Table 3 illustrates a final problem with the CPI. Here there is a market basket of only two items, apples and oranges, and from period 1 to period 2 the purchase of apples drops because their price rises and the purchase of oranges rises because their price drops. To tell whether or not inflation has occurred, we need to construct a price index, but we have a choice of two different market baskets. We can choose the market basket based on the early weights (10 apples and 9 oranges) or the market basket based on the late weights (8 apples and 11 oranges). Either choice is possible and as good as the other, but we will get different answers depending on the choice we make.

If one constructs a price index using the early quantities, one finds the market basket increases in price from $4.25 to $4.39, or a 3.3% increase. If one uses the market basket based on the consumption pattern of the second period, one finds the cost of the market basket *drops* in price from $4.35 to $4.31, a decrease of .9%. This pattern is normal; a price index based on early quantities will show a larger rise in prices than one based on late quantities. The reason is that neither takes into account that people substitute as the result of changes in price *structure*.

The CPI for 1988 is based on a market basket formed from consumer buying patterns that existed in 1982. If the Department of Labor had done another survey of consumer buying patterns in 1988, it would have found that consumers would be buying more of those items which had dropped in price or which had risen in price by small amounts. They would be buying less of items

which had risen in price much more than average. If these new weights were used to recompute the price index, the large price rises would have a smaller impact on the total. The smaller price rises would have more of an impact on the total because they would be more heavily weighted. Therefore the resulting price rises would look smaller. Table 3 illustrates this pattern. (If you want a technical discussion of this problem, check more advanced books under the topics Paasche and Laspeyres indexes.)

GROSS NATIONAL PRODUCT

Gross National Product, or GNP for short, measures the value of a nation's output of goods and services for some period of time, usually a year. It is not the only measure of output—the Federal Reserve, for example, publishes an index of industrial production—but the GNP has become a favorite among economists because it is the most comprehensive of output measures.

In arriving at GNP, the Commerce Department is careful not to *double count* transactions. Thus if it counted the sale of steel to General Motors from U.S. Steel and also the value of the cars which GM produced, it would count the steel twice, once in an unfinished form, and once in a finished form. Hence it will not count these intermediate transactions. In practice it avoids this by only counting the **value added** at each stage of the production process. Value added is sales minus the cost of raw materials and unfinished goods.

Neither does the Commerce Department count the sale of second-hand items. These were counted when they were originally purchased, and to count them again would involve double counting. Finally, it does not count financial transactions, such as the sales of stocks and bonds. These transactions involve sales of ownership or debt, and do not spring directly from the production of final output. The total of all transactions not counted is much larger than the size of GNP; total transactions are many times as large as GNP.

GNP measures the *value* of output, and thus can increase for two distinct reasons. It can increase because more goods and services are being produced, or it can increase because prices have risen and the same goods and services are being produced. To eliminate the changes in prices, one must compute **real** or **constant dollar** GNP, which values the output of various time periods with a set of fixed prices.

Table 4 contains output and price statistics for a simple economy which produces only three goods. In the first year the value of output or GNP is $1000, and in the second year GNP is $1120. These numbers are ob-

TABLE 4
PRODUCTION AND PRICES

	YEAR 1		YEAR 2	
GOODS	OUTPUT	PRICES	OUTPUT	PRICES
APRICOTS	10	$50	10	$55
BROCCOLI	10	$25	12	$25
CARROTS	10	$25	9	$30

tained by multiplying quantities by prices, and then summing the resulting values. They give us **current-dollar** or **nominal** GNP, that is, the value of output measured in prices which existed when the output was produced.

GNP has risen by 12% from the first year to the second, but this increase is only partially due to additional output. Part of the increase is due to changed prices. To get a measure that contains only the increase in output, we can multiply the outputs of the second year by the prices of the first year. When we do this and add up the values we obtain, we get a sum of $1025. This number implies that if only the quantities of output had changed and not the prices, GNP would have increased only from $1000 to $1025, a rise of 2.5%. This value of $1025 is real GNP.

The two values of GNP for the second year allow us to obtain a measure of inflation called the **implicit price deflator** or the **GNP deflator**. The formula for this index is:

$$\text{Price Index} = 100 \times \frac{\text{Nominal GNP}}{\text{Real GNP}}$$

For the example in Table 4, the price index will be 100x(1120/1025) = 109.27. This index says that the price level rose a bit more than 9% from the first year to the second.

Why does dividing current-dollar GNP by real GNP yield a price index? Current-dollar GNP can be thought of as a price level multiplied by an output level, or P_tQ_t, where the subscript t indicates the time period. Real GNP is the price level of the base year multiplied by the output level of time t, or P_bQ_t. Dividing the first by the second, the Q_t terms cancel out and we are left with P_t/P_b, or the price level of time t divided by the price level of the base year. Multiplying by 100 puts this into percentage terms, and thereby converts it to the form in which price indicies are normally reported.

Notice that if any two of the variables in the above equation are known, one can solve for the third using simple algebra. (See question 6 at the end of the chapter.) Also notice that the GNP deflator is not identical with the CPI, but provides an alternative to the CPI as a measure of inflation. Over long periods of time, both provide similar numbers, but they can diverge in shorter periods. For example, from 1974 to 1975 the deflator showed inflation increasing from a 5.9% rate to a 9.3% rate, while the CPI showed it decreasing from an 11% rate to a 9.1% rate.

GNP is often used as a measure of economic welfare, which means that it is assumed to show how well off people are in a material sense. There are, however, serious problems and dangers of misinterpretation when GNP is used as a measure of economic welfare. One of these limitations is that, with a few exceptions, GNP only counts goods and services which pass through organized markets. Production which is not bought or sold does not generally get counted.

The effect of ignoring nonmarket production can be important when one uses GNP to compare living standards of various countries, or to examine economic growth in a single country. To use GNP for these purposes, it must be put on a per-capita basis. When one looks at the per capita GNP of various countries, that is, at total GNP divided by population, one finds some countries which have per capita GNPs of only one or two hundred dollars. This may mean that the inhabitants of such countries are truly impoverished, or it may mean that most transactions are not market transactions. If a nomadic or agricultural society is self-sufficient within small groups, there may be considerable production, none of which is recorded in the GNP statistics because none of it reaches the market. This also means that a rapid rise in GNP may not reflect more production, but a shift in production from a nonmarketed form to a marketed form.

In the late 1960s several economists decided to adjust GNP to obtain a better measure of economic welfare (which they called Measure of Economic Welfare, or MEW). They noted that leisure was valuable, but this value was not recorded in GNP. If people work 60-hour weeks rather than 40-hour weeks, GNP will be higher, but people may be worse off. They also noted that many "bads" are included in GNP—higher crime rates lead

to more expenditures on police, international tensions lead to more expenditures on arms, more disease leads to more medical spending, etc.—and thus GNP overstates welfare. Further, the production of some goods also brings with it some bads—pollution is an example. Though these adjustments are sensible, putting them into numbers involves serious problems.

The Great Depression illustrates the problems of adjusting GNP to obtain MEW. The large drop in production brought a large increase in leisure and a drop in pollution. The value of these items offsets part of the drop in production, so MEW suggests that conditions in the 1930s were not really so bad after all. Since this is a questionable conclusion, deficiencies in MEW may be more serious than those in GNP. Certainly GNP is a better measure of how severe recessions and how strong recoveries are, and it may even be superior as a measure of welfare.

As interest in MEW waned, a new problem in GNP became the subject of considerable interest: the "underground economy." The underground economy consists of economic activity which is not reported to the government because those engaged in it are attempting to avoid taxes. When a waitress takes tips which she does not report, or a plumber offers to work for less if paid in cash rather than by check, or a farmer who sells vegetables at a roadside stand understates his revenues to the IRS, each is part of the underground economy.

There is no way to accurately know how important this activity is because it is unreported. All estimates of its size must be done by indirect ways. Some economists have looked at the large amount of currency in circulation and concluded that only the existence of large amounts of unreported transactions can explain why in 1984 the public held $150 billion in cash. (Checks leave trails behind because all checks are recorded on microfilm. The safest way to avoid detection of transactions which one does not want the government to know about is to use cash.) Other economists believe that the rising percentage of the population which is employed in the visible economy suggests that the underground economy has not been increasing in size and may not be very large. The dispute is a reminder that there can be measurement error of unknown size in economic statistics.

The problems of measurement error in deriving economic statistics was highlighted in a *Wall Street Journal* article of November 22, 1983. The article reported that the Federal Reserve had estimated personal savings in the second quarter of 1983 at an annual rate of $209.3 billion, and the Commerce Department had estimated personal savings for the same period at an annual rate of only $92.3 billion. Thus if one wanted to compute the rate at which Americans were saving, one had two very different figures to choose from, and could get two very different savings rates.

The Federal Reserve computed its savings statistic in the process of computing the sources and uses of funds raised in U.S. financial markets. Savings is found by adding the increase in financial assets households hold to investment such as new homes, and by subtracting the increase in personal debt. The Commerce Department computed its savings as part of the national income accounts which are briefly discussed in the next chapter. Savings is the difference between disposable (after-tax) income and consumption expenditures.

There are two ways to explain the huge discrepancy between these two estimates. One possibility is that the Commerce Department overlooks the "underground" economy, and thus income is understated. If income is understated but consumption is not, savings will be underestimated. Another possibility is that the Federal Reserve is not identifying foreign investment in the United States, but is including some of it as private savings, and thus overstating savings. Regardless of the cause, the discrepancy illustrates that there can be very large measurement errors in our economic statistics.

LEADING INDICATORS

If you want to forecast the economic future, you can do so without knowing anything about how the economy works. Further, your forecasts may turn out to be as good as those of professional economists. The key to your success will be the **Leading Indicators.** This is an index composed of twelve items which generally swing up or down before the economy as a whole does. These items include changes in money stock, stock prices, new orders, and other items which usually lead production and sales.

If you do decide to become a prophet, be aware that one-month changes in this index (or any other economic statistic) may not mean much. There is a certain amount of randomness (or "noise") in all of the numbers, and a one-month rise or fall may mean nothing. The rule of thumb for the leading indicators is that one should take seriously any rise or fall that continues for three months or more. Thus if the leading indicators drop three months in a row, there is a pretty good chance that a recession is on the way, and if they increase three months in a row after a fall, it is a pretty good bet that the economy will soon begin a recovery.

One final warning if you become a prophet: the government sometimes revises the numbers. It does this on all statistics as more data become available, so that sometimes GNP figures which are a decade old are changed. With the leading indicators the problem is often more noticeable because the Commerce Department initially announces them with only partial information, and then always revises them a month later. Sometimes that revision will make a decline into a rise, and sometimes it makes a rise into a decline.

SUMMARY

This chapter reviewed some of the major macroeconomic statistics which are used in the United States. It looked at the construction of the unemployment rate, the consumer price index, and the gross national product. In each case it also showed some of the weaknesses of the statistic.

QUESTIONS

1. Which of the following would be counted as unemployed using the Department of Labor definition of unemployment?

a. a person who quit a job to become a full-time student.

b. a 14 year-old girl who is looking for a babysitting job.

c. a person who lost his job a year ago, would like another job, but is not looking for one because he is sure that none is available.

d. a recent college graduate who is looking for a job, but will not accept anything paying less than $75,000.

e. a person working only five hours a week who is looking for a job that gives her 40 hour per week.

f. An illegal alien is searching for a job.

2. Suppose the army moves 10,000 troops abroad. How would this affect the two unemployment rates which the Department of Labor publishes?

3. What does Table 1 in the text look like with the most recent data available?

4. Stew D. Huss is a hard-working student who is concerned with the rising cost of getting an education. To see what is happening to the costs of education, he constructs a

Cost of Studying Index. The market basket he uses and the prices he observes are given below.

Market Basket: Item	Amount	Price in First Period	Price in Second Period
Pencils	2	$.08	$.12
Paper	10	$.05	$.06
Know-Doze	1	$.09	$.06

By what percentage has the cost of studying changed from the first to the second period?

5. The following table shows current-dollar GNP, a price index, and real GNP for three years. Fill in the blanks.

YEAR	GNP	PRICE INDEX (in billions)	REAL GNP (1958=100)
1943	$191.6	56.8	____
1956	419.2	____	446.1
1965	____	110.9	617.8

6. Compute the rates of inflation for the intervals in the table below using the two price indices. (That is, compute the rates for the 1930s, the 1940s, and for the period 1950 to 1970 using both the deflator and the CPI.)

Year	Implicit Price Deflator of GNP (1958 = 100)	CPI (1967 = 100)
1930	49.3	50.0
1940	43.9	42.0
1950	80.2	72.1
1970	35.2	116.3

Source: *Historical Statistics of the United States: Colonial Times to 1970* (Dept of Commerce, 1975, pages 197, 210-11.

7. Below is a table showing the population of Mythical County, somewhere in the United States.

Under 16	1800
In jail	50
In nursing homes	150
Employed full time	1500
Employed part time	500
Without work and searching for a job	400
Retired (living at home) Housewives not counted in any above category	400
Students not counted in any above category	400
Total Population	6000

(No one is counted twice in the above table, so the numbers sum to the population.)

What would Table 1 in the text look like for Mythical county?

8. Below are complete output and price statistics for the island economy of San Prospero:

	1987		1988	
	Output	Price	Output	Price
Grapefruit	1000	$.40	1200	$.30
Nuts	400	1.00	500	1.10
Pears	400	.50	300	.80

a) What are current-dollar GNPs for 1987 and 1988?
b) By what percentage does GNP increase from 1987 to 1988?
c) What is GNP in 1988 measured in 1987 prices?
d) By what percentage has real GNP increased?
e) What is implicit GNP deflator for 1988?
f) If one uses quantities of 1987 to form a market basket, what will the price index of 1988 be if 1987 is the base year?

9. This chapter discussed the distinction between real and nominal GNP. There are a number of other measurements, such as wages and interest rates, in which the distinction between real and nominal is also important.

Below is a table showing the implicit price deflator for several years.

	(1958=100)		(1972=100)
1931	44.8	1978	150.42
1932	40.2	1979	163.42
1933	39.3	1980	178.64

Sources: *Historical Statistics of The United States, 1776-1976*, page 197; *Survey of Current Business*, July 1982, p 99.

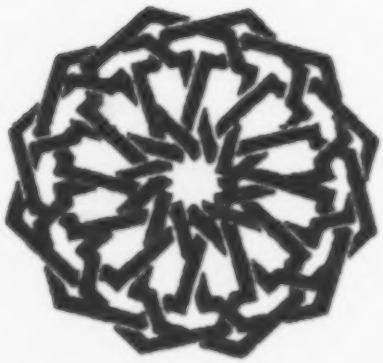
a. Suppose that John Smith had a job in 1931 with a salary of $1000 per year. Suppose that in 1933 his job paid $900 per year. Would his salary buy more in 1931 or in 1933? By what percentage would his purchasing power have increased or decreased? (Hint: In terms of 1958 prices, what is the purchasing power of $1000 of 1931 income? What is the purchasing power of $900 of 1933 income when measured in 1958 prices? By how much has purchasing power measured in 1958 prices changed?)

b. Suppose John Smith, Jr. had a job in 1978 which paid $16,000 per year. In 1980 his job paid $17,000 per year. Would his income in 1980 buy more or less than his income in 1978? By what percentage would his real income have changed?

c. In 1932 the interest rate on short-term government debt was about 0.8%. A person who started the year with savings of $10,000 could have ended the year with $10,080 if he had invested at this rate. The percentage by which the purchasing power of the original $10,000 would have changed is the real interest rate. Approximately what was the real interest rate in 1932? (Comment: use the change in price index from 1931 to 1932.)

d. In 1979 the interest rate on short-term government debt was about 10%. A person who had $10,000 invested at this rate could have increased his savings to $11,000 during the year. But by what percentage would the purchasing power of his savings have changed? Approximately what was the real interest rate in 1979?

e. In 1932 the interest rate was only .8%. In 1979 it was 10%. In which year was the real interest rate higher?



CHAPTER 7

CONNECTIONS

After you finish this chapter and work the questions at the end, you should be able to:

Explain the two ways in which GNP can be broken down into components and list and define these components.

Define a transfer payment and give an example.

Define Net National Product, National Income, Personal Income, and Disposable Income.

Explain the budget constraint which the economy faces.

Summarize the debate between the underconsumptionists and the developers of Says' Law in the early 19th century.

Explain why the planned expenditures and sources of income of transactors should sum to zero, and how this lets one talk about interdependence among markets.

Define Walras' Law.

Explain why economists aggregate so much in macroeconomics.

List the four aggregated markets most commonly used in macroeconomics.

Macroeconomics involves much more aggregation or summing together of parts than does microeconomics. In microeconomics the assumption that each industry can be examined in isolation simplifies the analysis so that a normal human can understand it. This assumption is of no use in macroeconomics because the relationships between industries and various sectors of the economy are the center of analysis.

This chapter shows two ways of illustrating these connections among the various parts of the economy. The first is national income accounting, an expansion of the topic of GNP which you met in the previous chapter. This way has been heavily stressed in introductory textbooks because it meshes very nicely with the income-expenditure model, the most popular macroeconomic model in the 1950s, 1960s, and 1970s. The second way involves a method with roots far back in the 19th century, in what is known as Say's Law. It is a more flexible approach than the national income accounting approach, and it shows relationships between microeconomics and macroeconomics better.

NATIONAL INCOME ACCOUNTING

Gross National Product, the value of a nation's output of goods and services, is related to a series of other measurements. Because each transaction has two sides, involving both a sale and a purchase, there are two ways to divide up GNP. One can look at the expenditures made on or the uses of output, or one can look at the incomes which the production of output generates. In addition, by deriving a series of other measurements, one can compute how much of GNP is left as spendable income in the private and government sectors, which allows one to construct a "budget constraint" for the economy as a whole.

Let us begin by dividing U.S. GNP into its uses. The output that is produced goes to four groups. Table 1 shows that the largest amount goes to ordinary people and is classified as **consumption**. The food, the clothes, the medical check up, and the gasoline you buy are all consumption expenditures. The next largest use of output is by the government, including state and local governments in addition to the federal government. This category of **government spending** includes items such as purchases of military goods, payments to public school teachers, and the salary of your congressman. It may surprise you that in 1982 the expenditures of state and local governments were larger than those of the federal government: $390.5 million for the former and $258.7 for the latter. Not included as government expenditures are payments for which no service is expected, such as payment of social security to the elderly. This sort of transaction is classified as a **transfer**.

Investment is the third category. It includes construction of new factories and the purchase of new machines by businesses. It also includes changes in inventories held by business and the purchase of new homes by consumers. Homes are considered a long-lived asset, one that will yield services for many years. On the other hand, purchases of appliances and vehicles by consumers are considered consumption, though these items also have lifetimes much longer than a year. In practice the dividing line between investment and consumption is fine and sometimes shifts. Thus at one time the purchase of a mobile home was classified as consumption, but it is now classified as investment.

The use of the word investment in discussing GNP differs from the use of this word in every day speech. People talk about investing in stocks and bonds, for example, yet purchases of stocks and bonds are not considered investment for purposes of computing GNP. In fact these transactions are not counted at all because they involve the exchange of existing or new financial instruments, not the purchases of actual output. If you loan a company money by buying a newly issued bond, investment will be affected only if the company uses your money to purchase new capital or to increase inven-

TABLE 1
GROSS NATIONAL PRODUCT, SELECTED YEARS
(Numbers in Millions)

	1933	1960	1982
GNP	55.6	503.7	3069.3
Consumption	45.8	325.2	1984.9
Government Spending	8.0	99.6	650.5
Investment	1.4	74.8	414.9
Net Exports	.4	4.0	19.0
Compensation of Employees	29.5	294.2	1864.2
Corporate Profits	-1.2	49.9	159.1
Proprietors' Income	5.9	46.2	111.1
Rental Income	2.0	15.8	51.5
Net Interest	4.1	8.4	260.9
Depreciation	7.0	43.4	358.8
Indirect Business Taxes & Misc.	8.3	45.8	263.6

Sources: *Survey of Current Business*, Nov. 1984; *Historical Statistics of The United States, 1976*, pp. 229-30, 234-36.

tory. Differences in the way economists use words and the way they are used in everyday conversation are common.

The last group that receives the output that our economy produces is foreigners. To take this group into account, we must add exports to consumption, investment, and government spending. However, some consumption, investment, and government spending is for goods that are produced in other countries, not here. One way to account for these purchases of foreign products would be to adjust consumption, etc. so that they included only the amounts spent on domestic products. However, this is not the way imports are taken into account. They are subtracted from exports to obtain **net exports**. A reason for this procedure is that data for imports as a whole is more reliable than data broken into imported consumption expenditures, imported investment expenditures, and imported government expenditures.

The very small numbers for net exports in Table 1 disguises the importance of foreign transactions. In 1982 exports were $347.6 million, or over ten per cent of total production, and imports were $330.2. Since they are similar in size, their difference, net exports, is fairly small.

We can summarize our discussion so far in terms of an equation which you will see again in future chapters:

(1) GNP = C + I + G + Xn

The alternative way to break down GNP, to which we now turn, is to consider the incomes which the production of output generates. The largest income generated in producing output is in the form of **employee compensation**. The major part of this category is pre-tax wages and salaries, but it also includes some other items such as employers' payments into the Social Security program. As Table 1 indicates, compensation of employees has always been the largest type

of income which is generated in production.

A second, obvious item in computing GNP by looking at incomes is **corporate profit**. Corporate profit includes the amounts which corporations pay in the form of the corporate income tax, the amounts they pay stockholders in the form of dividends, and the amounts they "save" or retain within the business.

The category **proprietors' income** captures a class of income that falls between wages or salaries and profits. It is the amount which those who are in business for themselves, but who have not incorporated their businesses, earn. The amount which the owner of a cafe or a farm earns in a year is often considered by the owner of the business as a "profit," yet most of that "profit" is a payment to the owner for his labor. Because it is difficult or impossible to separate out of this income the part that is truly a "wage" to the owner from that which is actually a profit, the folks at the Commerce Department who collect the numbers keep it in the separate account of proprietors' income.

The major part of **rental payments to persons** is in the form of imputed rent of owner-occupied housing. Imputed rent estimates how much rent people who own their homes would pay if they had to pay rent, and assumes that they then pay this amount to themselves. This is the major class of nonmarket production which GNP includes. The production which housewives contribute in the home is not counted, crops grown for home use in a vegetable garden are not counted, and home repairs which a person does for himself are not counted. In all these cases there is production of goods or services and these goods and services could be purchased in the market. They are not included because estimating their value is too difficult. The Commerce Department does not believe that it is as difficult to estimate the services which a home provides, so does count the value of these services. Also included in rent are royalties and income which comes from the ownership of patents.

The payment of **interest** includes interest which businesses pay as part of the expense of operating less the amounts businesses receive as interest. Thus this category includes only interest which the business sector as a whole pays out. This category does not include the interest which consumers pay because it is not considered as a payment stemming from the production of output, nor does it include interest which the government pays on its debt. Government interest payments are seen as transfers because no output is produced which the interest supports. In contrast, when General Motors pays interest, this interest is a payment for funds used to purchase machines or other assets necessary to carry on the business.

Depreciation, or **Capital Consumption Allowances**, is included because we are measuring Gross National Product, the total value of output. In the course of producing goods and services, some of the existing capital stock is used up. Factories, trucks, computers, and drill presses all have limited lives, and the use of these items uses up some of their lives and thus their value.

The concept of depreciation can be explained by a simple example. Suppose a farmer plants 100 bushels of seed and harvests 10000 bushels. His gross harvest is 10000 bushels, but his net harvest is only 9900. If he had planted nothing, he would have had 100 bushels of grain, so he gains only 9900. Part of his cost is the using up of 100 bushels of seed.

You might at this point decide that a better measure of what the economy produces would be to subtract the capital consumption allowances from GNP and use the net figure. This can be done, and the resulting number is called the **Net National Product**, or **NNP**. While the NNP does make more sense as a measure of the economy's output, economists prefer not to use it because the capital consumption allowance is less reliable than the data used to calculate GNP. Since NNP is computed by subtracting the capital consumption allowances from GNP, it will be a less reliable number than GNP. In addition, depreciation is not as quickly available as are the rest of the data needed to give a good estimate of GNP, so NNP numbers are

announced later than GNP figures. In the tradeoff between reliability and theoretical attractiveness, economists have chosen reliability.

There is one final class of "income" to which production gives rise, though no services are rendered for it. This is the class of **indirect business taxes,** the most important parts of which are sales and excise taxes. This item must be included to make the expenditure or use side equal the income side. A sales tax causes the amount which consumers pay to exceed the amount which businesses receive. Though not a true income because it is not a payment for services, it is part of the value of final output. If one wants to speak only of income which resources earn, which economists define as **National Income**, one must eliminate both the Capital Consumption Allowance and the Indirect Business Taxes from GNP.

To get from National Income to **Disposable Income** (DI), which is the income which people can either spend or save, a number of adjustments must be made. First, that part of corporate profits which never reaches households, retained earnings and corporate taxes, must be deducted. Then adjustments must be made in interest so that it includes only and all interest payments reaching households. Then payments to the government for social security and related programs must be subtracted, and transfer payments from the government for these programs and other programs must be included. Finally, business transfer payments, which include donations to non-profit organizations and the write-off of bad debt, are added. This gives what is called **Personal Income**. Some of Personal Income must be paid as taxes. What is left, Disposable Income, is either spent or saved.

There is a point to all these computations. In deriving disposable income from GNP, we separated amounts flowing to households from the rest of GNP. In the process, we can see where the rest goes. Some stays in the business sector as business savings. Retained earnings and depreciation are important parts of this sum. Some income ended up with the government. The amount which the government is left with is the total of taxes less all transfers. Finally, somewhat lost in the numbers are some transactions involving foreigners. They pay us interest, we pay them interest, and there are also transfers in the form of aid. Let us call this total "Foreign Transfers (Tf).

This separation allows us to write GNP in this way:

(2) GNP = DI + Business savings + (Taxes - Transfers) + Tf

Disposable income is either consumed (C) or saved. If savings by households is combined with business savings to get savings by the private sector (S), equation 2 can be written:

(3) GNP = C + S + (Taxes - Transfers) + Tf

Since equations 1 and 3 are both ways of arriving at GNP, we can combine them as:

(4) C + I + G + Xn = C + S + (Taxes - Transfers) + Tf

Reorganizing, and letting consumption cancel from both sides, gives:

(5) (I - S) + (G + Transfers - Taxes) + (Xn - Tf) = 0.

Equation 5 is a constraint which the economy as a whole faces. It may not mean a great deal to you when you first look at it, but in fact it is an important equation. Consider what the contents of each set of parentheses mean. The first term tells us about the private sector. If investment is greater than savings, the private sector must borrow to finance the extra investment. If savings is greater than investment, the private sector will lend to other sectors.

The middle term, (G+Transfers-Taxes) is the government deficit or surplus. Total government expenditures equal its purchase of goods and services plus its transfers. If these are larger than tax receipts, the government has a deficit, and must borrow to cover it.

The last term indicates the amount of borrowing foreigners must do to finance their expenditures. When they buy from us, they

TABLE 2
THE U.S. BUDGET CONSTRAINT

	1982	1984
Investment - Savings	-109.1	-37.0
Government Deficit	115.3	122.9
Foreign Borrowing	-6.6	-93.4
Statistical Discrepancy	.5	7.5

Sources: *Survey of Current Business*, Nov. 1984, 1985. Amounts are in billions of dollars; a negative represents lending to credit markets and a positive represents borrowing. The "statistical discrepancy" occurs because there are measurement errors in measuring the components.

must have a source of funds. One source is selling to us. If they sell less than they buy, they must borrow the difference. If we buy more from them than we sell to them, we must borrow the difference.

We have arrived as at a simple result in a complex way. In any market the purchases of buyers must equal the sales of sellers. Equation 5 shows this for the market for loanable funds. If someone borrows $100, then someone else must lend $100. Equation 5 divides up all transactors in this market into three groups, the private sector, the government, and the foreign sector. Equation (3) says that not all sectors can borrow at the same time. When one borrows, another must be lending. Financial markets link the decisions of people who may have no idea that their decisions are in fact connected.

Table 2 puts some numbers from the U.S. economy into this equation. Notice how dramatically foreign borrowing changes in just two years. In 1984 the United States had a huge deficit in its balance of trade—it bought much more from foreigners than it sold to them. Table 2 says that the dollars which foreigners earned on these sales were returned to the U.S. government and businesses in the form of foreign loans.

It would be nice if Table 2 could tell us why the large amount of foreign lending to the U.S. suddenly occurred. However, the table, and the equation on which it is based, cannot do that. They simply tell us that there are connections among the sectors of the economy. If the government sector runs a larger deficit, for example, other sectors must finance the deficit. Thus these other sectors will be affected. Though the equation clearly shows that a change in the government's deficit will affect other sectors, it does not tell us what the effects will be. For this we need economic theory, and in this we do not find consensus among economists. On one hand, Keynesian economists (those who draw inspiration from the writings of John Maynard Keynes) have argued that an increased deficit may increase savings by more than the increased deficit, and thus actually increase investment. On the other hand, non-Keynesians have usually argued that the increased deficit will have little effect on savings and will *crowd out* investment. Explaining these theories will be a major purpose of later chapters.

SAY'S LAW

Equation 5 indicates that various parts of the economy are connected, though it does not tell us a great deal about the connection. Another, more flexible way of illustrating the connection is to use an insight from *general equilibrium* theory. Key elements from this approach date from the early 19th century,

where they appear as **Say's Law**. Though these ideas are named after French economist Jean Baptiste Say (1767-1832), they were developed by several economists in addition to Say.

When economists study the work of earlier economists, they often have disputes about what the earlier economists really meant. Thus there are shelves of books and articles about What Marx Really Meant, and the number about What Keynes Really Meant has been growing rapidly. The dispute about What Say's Law Really Means is far smaller, but it has yielded a number of positions. A reason that these controversies can exist is that writers are sometimes ambiguous in what they say, and their positions can be interpreted in a number of ways. The following interpretation of Say's Law is not the only possible interpretation.

Though the popular expression of Say's Law is "Supply creates its own demand," this quotation does not appear in Say's writings nor in the writings of the other economists of his time. The "law" was developed at a time when economists had begun to notice that the economic system could be subject to "crises," periods that today we call recessions. They did not have the economic statistics that we have now to identify these periods, but traders and merchants were aware of them through increased bankruptcies, slower trade, sometimes runs on banks, and an increase in beggars.

The question of the nature of these crises, their causes, and their relationship to the economic system became a topic of debate. The major figure on one side of the debate was Thomas Malthus, better known for his theory of population. He argued that crises were a result of a "general glut" of goods. The production of goods could outrun the ability or desire of people to purchase these goods, and it was this oversupply or **underconsumption** that led to an economic crisis.

On the other side of the debate were David Ricardo, James and John Stuart Mill, and Say. Those ideas which are called Say's Law were developed by all of them in their attempt to show that the underconsumptionist thesis was wrong.

Say's Law can be illustrated with a three-person, three-commodity, barter economy. Let our three persons be Crusoe, who is a fisherman, Friday, who collects coconuts, and Saturday, who grows bananas. Crusoe will catch fish for two reasons, either because he wants to eat them himself, or because he wants to trade them for coconuts and bananas. Friday and Saturday also work either to consume their own output or to trade it. If initially each banana and coconut are worth one fish, Crusoe may plan to trade five fish for two coconuts and three bananas. (These numbers are made up and have no special significance.) In Table 3 these plans are shown with a positive number indicating that a person *plans* to supply a commodity to the marketplace and a negative number indicating that a person *plans* to demand a commodity from the marketplace. The numbers show what each wants to do at the existing set of prices, not necessarily what each actually does.

TABLE 3 PLANNED SALES AND PURCHASES

	Crusoe	Friday	Saturday	Sum
Fish	+5	-1	-2	+2
Coconuts	-2	+5	-3	0
Bananas	-3	-4	+5	-2
Sum	0	0	0	0

In a barter world, buying cannot be done unless one sells at the same time, and selling cannot be done unless one buys at the same time. In a world of barter, the only way one can finance purchases is by selling, and there is no reason to sell except to finance purchases. It is for this reason that Say's Law implies that a column should sum to zero. The act of supplying is also an act of demanding; supply creates its own demand.

Table 3 contains the plans of Friday and Saturday in addition to Crusoe. Notice that adding each of their columns results in a total of zero. If, however, rows are added, there is no need to sum to zero, and the rows for fish and bananas do not sum to zero. A non-zero total here means that plans will not be realized (work out). The +2 in the fish row indicates that at the original prices there will be an oversupply or surplus of fish. The -2 in the banana row means that at the original prices there will be an overdemand or a shortage of bananas. To make the markets clear, the price of fish should fall and the price of bananas should rise. In turn, the new prices will affect future plans. Most economists (but certainly not all) have believed that, with repeated changes in prices and plans, eventually an equilibrium situation will be reached so that all rows will sum to zero—that quantity supplied will equal quantity demanded in each market.

Table 3 implies that there can be no general glut or oversupply of goods, which was the point Say and others were arguing. It is possible for "gluts" of particular goods, but counterbalancing this is a shortage or undersupply of other goods. It is not possible, given the assumption that columns must sum to zero, for an oversupply (or underdemand) of all goods to exist. This conclusion won the debate in the early 19th century and remained unchallenged until the 20th century.

Table 3 also implies that if all markets except one are balanced, then the last one also must balance. This conclusion has become known as Walras' Law. It was named after Leon Walras, (1834-1910) one of the first mathematical economists, a man who formally developed the theory of general equilibrium. (Say's Law captured in a verbal and intuitive way the spirit of general equilibrium analysis.) Walras' Law says that if a system has n markets, and n-1 of them are in equilibrium, then the final nth market must also be in equilibrium. This conclusion is widely used in macroeconomics (because it says we can ignore a market), and we will appeal to it in later chapters to justify conclusions.

Table 3 is a model of a barter economy. No money is involved in trade. Fish trade directly for bananas, bananas trade directly for coconuts, and coconuts trade directly for fish. The introduction of money complicates the model and invalidates the original conclusion of Say's Law, that there can be no oversupply of goods. As before, columns must sum to zero, but now Crusoe catches fish either to consume himself, to trade for bananas or coconuts, or to trade for money. As a result, a "general glut" or an oversupply of goods will occur when there is an overdemand for money. This possibility is illustrated in Table 4.

The most interesting part of a table such as Table 4 is not the light it casts on the "general glut" controversy, but the way it illustrates the connections among markets. Table 4 is more useful than Table 3 for this because entries can more easily be discussed in terms of values—prices multiplied by quantities. Thus if the monetary unit is a dollar, the +5 in Crusoe's column represents $5.00 worth of fish he plans to supply to the market. As a result one can more easily discuss the central assumption that makes the columns sum to zero, that expected or planned sources of funds must have expected or planned uses. Since the columns sum to zero, any change in one market must affect other markets. If Crusoe decides he wants to spend more on bananas, he must either expect to spend less on coconuts, reduce cash balances, or sell more fish.

The interaction among markets involved in Table 4 is in some ways similar to the way the showers in a large shower room interact. Suppose ten people have all adjusted their

TABLE 4
AN OVERSUPPLY OF GOODS CAN OCCUR IF THERE IS AN UNDERDEMAND OF MONEY

	Crusoe	Friday	Saturday	Sum
Fish	+5	-2	-2	+1
Coconuts	-2	+5	-3	0
Bananas	-2	-3	+6	+1
Money	-1	0	-1	-2
Total	0	0	0	0

showers so that the water temperature and pressure are just right. When an eleventh person comes in and turns on another shower, all the other people are affected and they may find that they do not like the changed temperature or pressure. They will begin to turn valves in hopes of adjusting back to their previous condition. Instead of showers in Table 4, we have markets. Changes in any one market affect supply and demand curves in other markets, causing prices and quantities in these markets to readjust.

The interactions among markets is crucial and central in macroeconomics. Though the true meaning of Say's Law may be a matter of dispute, this interaction of markets which Table 4 illustrates is not in dispute. Rather it is at the center of many current controversies among macroeconomists. If a system of many interdependent markets is in disequilibrium, will it return to an equilibrium? If it does return to an equilibrium, what factors determine the speed of adjustment? Can there be more than one equilibrium in such systems? Does it matter for the adjustment process if markets are not competitive? Can an equilibrium for the system exist if some markets do not clear, that is, can some markets have surpluses or shortages when the system as a whole is in equilibrium? Finally, what sorts of forces cause disequilibrium in the first place?

AGGREGATING MARKETS AND SECTORS

Aggregating, that is, adding together items to make a whole, is commonplace in economics. The notions of supply and demand, for example, depend on the aggregation or adding together of the demands of many individual buyers and the supplies of many individual sellers. Though all of economics involves aggregation, the amount of aggregation is much greater in macroeconomics than in microeconomics.

There are no clear rules for how much aggregation should take place. The amount of aggregation that an economist does depends on the purpose he has. The whole process of aggregation involves conceptual problems and ambiguities, but the simplifications which aggregation can introduce can more than pay for the problems involved.

To illustrate the problems involved in aggregation, consider a discussion of the supply and demand for apples. In such a discussion, one has made a decision that certain items should be considered together—yellow and red apples, winter and fall apples, eating apples and cooking apples. When one discusses the "apple market," one implicitly assumes that the differences among the various varieties of apples are small enough to ignore for the purposes at hand, but the

TABLE 5 EXPECTED SOURCES AND USES OF FUNDS

	PRIVATE SECTOR	GOVERNMENT SECTOR	FOREIGN SECTOR
GOODS AND SERVICES			
LABOR (AND RESOURCES)			
MONEY			
BONDS (AND OTHER ASSETS)			

Total must sum to zero

differences between apples and pears, very similar fruit, are too large.

For some purposes one might want to aggregate more and speak of the "fruit market" rather than the "apple market." Further aggregation would lead to the food market. At this level of aggregation, one is not only adding apples and oranges together, but apples and beefsteak. Though this may seem like aggregation gone wild, macroeconomists customarily aggregate a great deal more. They discuss the market of goods and services, the labor market, and the bond market. The advantage of this drastic aggregation is that it simplifies the workings of the system to the point at which the human mind can begin to understand it.

Aggregation allows one to use the insights of Say's and Walras' laws to discuss conditions of equilibrium. Our economy is more complex than the simple economy of Crusoe, Friday, and Saturday. Not only do we have many thousands of goods and services which we exchange, but we also have a complex array of debts and assets which are also exchanged. Further, most people are not craftsmen or farmers producing and selling products, but work in organizations. Thus most people are engaged in another market, one in which they sell their labor. This adds another set of markets to our economy.

The central idea in Tables 3 and 4 is that if people plan or expect to receive a certain amount of income, they also have planned or expected uses. Thus a change in one market (such as the market for high school science teachers) will have affects in other markets (such as the markets for food and clothing). But tracing these effects from market to market is beyond the power of the human mind if we attempt to view the economy as made up of many thousands of markets. The solution has been to aggregate and create "composite" goods, so that we can picture the economy as made up of only a few markets.

There is no magic formula for the "right" amount of or way to aggregate. Some theories imply a drastic aggregation to just two markets—we will see that both the quantity theory of money and the simple income-expenditure model imply an aggregation to just two markets. However, economists usually prefer less aggregation. In modern market economies households mostly use funds to buy goods and services. In addition to selling goods as in a barter economy, households have three sources of funds to finance these purchases. They can earn

TABLE 6 ACTUAL SOURCES AND USES OF FUNDS

	PRIVATE SECTOR	GOVERNMENT	FOREIGN
NONFINANCIAL MARKETS	I - S	G + TN - TX	Xn
FINANCIAL MARKETS	S - I	TX - G - TN	-Xn

income by selling the services of their labor or other resources, they can borrow money or dissave, and they can reduce money balances. Usually the way economists aggregate reflects this list of sources and uses of funds.

Table 5 shows a way of aggregating that is useful for the discussions in this book. In this table all the millions of buyers and sellers have been grouped into only three categories: those in the private sector, the government and the foreign sector. Often less aggregation is needed in the private sector. It can be separated into households and businesses, and sometimes the banking sector is split away from the rest of the business sector.

The markets in which people exchange have also been reduced in number, to a mere four. All goods and services are grouped together, and all labor markets and other resource markets are consolidated. All financial transactions, involving the purchase and sale of securities, are combined to form the market for bonds (and other assets). Finally, to include the possibility both of changes in the amount of money circulating and the amount that people want to hold, a market for money balances is included.

There are no numbers included in Table 5. Entries are of planned or expected amounts, and there is no way of knowing these. The problems involved can be understood if one looks back to the supply and demand model. If a market is not in equilibrium, the desired amounts that buyers and sellers want to exchange are not equal, but the actual amounts that they do exchange are equal. Actual amounts can be observed, but they do not tell one if the market is or is not in equilibrium. Desired amounts, which would tell one whether or not the market was in equilibrium, cannot be directly observed. Thus though one can get estimates of the actual amounts in each category in Table 5, they do not help in seeing which markets have excess supply and which have excess demand.

Table 5 does, however, illustrate in a more general way the connections between sectors of the economy than does equation 5, and can in fact show equation 5. To show equation 5, combine the goods and resources markets and consolidate the money market with the bond market. These changes plus a switch to actual transactions from planned transactions give us Table 6. The actual (not planned) excess demand in the nonfinancial markets for the private sector is investment minus savings, for the government it is government expenditures minus taxes, and for the foreign sector it is net exports. Because the actual values of these items are included, they must sum to zero both horizontally and vertically. The table indicates that excess demands in the nonfinancial markets will yield excess supplies in the financial markets, and vice versa.

SUMMARY

This chapter explores two ways of illustrating that various sectors of the economy are linked. Both ways, one based on national income accounting and the other on general equilibrium analysis, show that what happens in one part of an economy can make changes happen in other parts. This demonstration of interdependence forms the starting point in our search for reasons for inflation and unemployment. It tells us that the causes of inflation, a result visible in markets for goods and services, and of unemployment, a result visible in markets for labor services, may lie in places that seem at first glance unrelated. Much of the rest of the book will look at various possible sources of business fluctuations which are evident in the form of inflation and unemployment.

The interdependencies illustrated with the tables discussing Say's Law also give rise to another set of questions. If there is a disturbance in one sector so that that sector is put out of equilibrium, all other sectors may have to adjust to restore equilibrium. If only one sector does not adjust readily, then the whole economic system will adjust only slowly. Thus as we look through the various parts of the economy to find the sources of disturbances, we will also be asking whether we can expect that sector to adjust quickly or slowly to disequilibrium.

QUESTIONS

1) How would each of the following affect the way in which GNP is divided into its various uses or incomes?

a) An apartment building is sold by an individual to a corporation.

b) A man marries his housekeeper.

c) A corporation issues stock and uses the proceeds to reduce the bonds the public holds.

d) A secretary who does absolutely nothing is fired by General Motors and is hired by the state of Michigan.

e) People receiving welfare are reclassified as government employees.

f) A farmer incorporates.

2) "GNP may not measure what is produced because some of what is produced may not be bought. For example, if more clothing is produced than is bought, consumption spending on clothing will be less than the value of production. Hence adding up consumption, investment, government spending, and net exports will not equal total production." Explain why this opinion is wrong.

3) Suppose we have an economy with three persons and four commodities, including money. The table below shows what each would like to do at the existing prices. Numbers show the value that a person plans to supply or demand, with a + indicating that a person plans to supply the item, and a - indicating that the person plans to demand the item. Fill in the missing numbers.

	Crusoe	Friday	Gilligan
Money	0	0	0
Fish	+1	+1	___
Yams	+3	___	+2
Shoes	___	+2	+4

Suppose the price of fish is one yam. Do you expect this price to rise, fall, or remain the same once these people begin trading? Explain.

4. Below are statistics for U.S. GNP and its parts for 1944. Data are in terms of 1944 prices and are in billions of dollars.

GNP	$210.1
Compensation of Employees	121.2
Consumption	108.3
Proprietors' Income	29.8
Corporate Profits	23.8
Indirect Taxes & other	16.5
Depreciation	11.0
Investment	7.1
Rental Income	5.4
Interest	2.3
Net Exports	-1.8

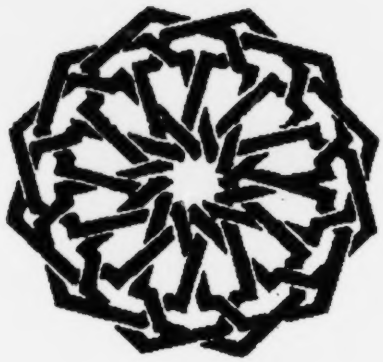
a) How large were government purchases in 1944?
b) By how much was the capital stock changing?
c) In 1958 prices, 1944 GNP was 361.3. What was the value of the GNP deflator for 1944?
d) What was the value of National Income in 1944?
e) What was the value of Net National Product in 1944?
f) Imports for 1944 were 7.1. What were exports?

5. Below is a table showing the buying and selling plans in a primitive three-person, three-good economy. A plus sign indicates a desire to sell, and a minus sign indicates a desire to buy. Potatoes serve as money in this economy, so all numbers represent potato values. (For example, the +5 for Matt in the fish column means that Matt wants to sell 5 potatoes worth of fish.) Fill in the missing numbers. Is this system in equilibrium? Explain.

Market

		Fish	Apples	Potatoes
	Matt	+5	-2	___
Trans-	Ed	___	+5	-4
actors	Pete	-2	___	+5

6. In 1963 savings by the private sector in the United States was $95.2 billion. The government ran a deficit of $3.8 billion, and the U.S. invested a net of $3.8 billion in foreign countries. What was gross private investment in the United States in 1963? (Source of data: *Economic Report of the President*, January 1987, Table B-27, p. 276.)



CHAPTER 8

FINANCIAL MARKETS

After you finish this chapter and work the questions at the end, you should be able to:

List some of the major financial markets.

Name some of the government agencies which are involved in financial markets and tell what they do.

Distinguish between the federal funds rate, the prime rate, and the discount rate.

Name some common financial intermediaries.

Give two reasons that savers use financial intermediaries.

Define liquidity.

Describe what a t-bill is.

Explain why a balance sheet must balance.

Explain how instability can arise in financial markets, and why most economists do not consider such instability to be a major source of macroeconomic disturbance.

Define what is meant by an "efficient market."

Distinguish among floating, pegged-and-convertible, and pegged-and-nonconvertible exchange rates.

Explain the effects of a tariff with a floating exchange rate.

List some transactions which supply dollars to the foreign exchange market.

The last chapter showed that markets are interrelated, and that a problem in one market can have its source in a different market. This finding is a starting point for macroeconomics. To limit the number of markets they must explore, economists conventionally lump together or aggregate the vast number of markets in a modern economy into only four: markets for goods and services, financial assets, money balances, and resources.

In this and in following chapters we will examine these four aggregated markets. As we visit each, we will ask two questions: "Is this market a likely source of instability which shows up as inflation or recession," and "Will the adjustment process in this market cause problems for the overall adjustment of the economy." (If you want a sneak preview of the conclusions we will reach, see Table 1 in Chapter 13.)

We begin our analysis in the financial markets. There is no one correct place to begin, and we could as easily begin in any of the other three markets. The advantage of beginning in the financial markets is that they introduce us to institutional details and some concepts which will be very valuable as background when we turn to the other markets.

MARKETS AND PLAYERS

Most people do not enter financial markets directly but rather go through **intermediaries** or middlemen. Common financial intermediaries include savings and loan associations, mutual funds, pension funds, credit unions, and to some extent insurance companies. Perhaps the most common intermediary is a commercial bank. One deposits money in a bank, and the bank uses the funds made available to it to make loans to home buyers for mortgages, to students so they can pay for their education, to business to finance inventories, and to anyone else who needs to borrow. A person who has extra money could, of course, seek out borrowers himself and bypass the intermediary. But the fact that this is uncommon indicates that there are costs involved, and that most people find it worthwhile to use an intermediary even though this means they will have a lower return.

Using financial intermediaries provides two important advantages to savers. First, lending through an intermediary is usually **less risky** than lending directly. The major reason for reduced risk is that a financial intermediary can diversify. It makes a great many loans, and even though some of those loans will be mistakes, the losses will be largely offset by loans which are sound. In contrast, if an average saver does not use a financial intermediary, he can make only a few loans, and any bad loans will substantially affect his wealth. Because an intermediary can put its "eggs" in many "baskets," it insures its depositors from substantial losses.

Another reason financial intermediaries reduce risk is that by making many loans, they learn how to better predict which of the people who want to borrow money will be able to repay. Someone who does not specialize in this lending may be a poor judge of which loans are worth making and which are not, though even a specialist will make some mistakes.

A second advantage that a financial intermediary gives a saver is **liquidity**. Liquidity is the ability to convert assets into a spendable form—money—quickly. A house is an illiquid asset; selling one can take a great deal of time. If an individual saver has lent money directly to another person, the loan can also be an illiquid asset. If the lender suddenly needs cash, he must either persuade the borrower to repay quickly, which may not be possible, or he must find someone else who will buy the loan from him, which may be very difficult. But one can get liquidity from savings lent to a financial intermediary. The intermediary may use the funds to make illiquid loans, but because of its size, it holds some funds idle as cash to provide liquidity to individual depositors. Only when a great many depositors want to withdraw

deposits at the same time, which happens when there is a "run" on the institution, will the financial intermediary be unable to provide liquidity. It will then be forced to suspend payments to depositors.

Financial intermediaries help large numbers of people to use, though indirectly, financial markets. Though these intermediaries are important in the macroeconomic functioning of the economy, they are usually stable and change only slowly. With the exception of those intermediaries which issue deposits against which checks may be written, economists do not expect disturbances to arise in financial intermediaries. As a result, macroeconomic theory does not pay much attention to them.

The federal government regulates financial markets and intermediaries, and it also is a major financial intermediary itself. Agencies which have regulatory functions include the Securities Exchange Commission (SEC), the Federal Deposit Insurance Corporation (FDIC), and the Federal Savings and Loan Insurance Corporation (FSLIC). The SEC regulates behavior in stock and bond markets, and also specifies which information a publically-traded company must provide to shareholders. The FDIC insures deposits at commercial banks, and the FSLIC insures deposits at savings and loan associations.

The U.S. government makes extensive loans for agriculture and housing. Because the government can borrow at a lower interest rate than most private borrowers, and because it does not need to make a profit, it can lend at lower interest rates than private intermediaries can. The government also subsidizes borrowers by guaranteeing loans which private lenders make. However, the issues which these actions of the government raise are primarily microeconomic in nature.

From a macroeconomic perspective, the most important government institution involved in financial markets is the Federal Reserve System. The Federal Reserve System (often referred to as the "Fed" by economists and bankers) is the central bank of the United States. A central bank functions as a banker's bank. Just as individuals and businesses have deposits at a regular bank and can write checks on these deposits, banks have deposits at a central bank and can write checks on these deposits.

The Federal Reserve System is a rather strange "central" bank because it is composed of 12 separate banks. When you examine your paper currency, you will see the name of one of these 12 banks on the left side of the portrait along with the district number and letter. This strange structure exists because of the political realities which faced Congress when it established the system in 1913. Over the years the independent authority of these 12 banks has diminished and policy-making authority has become centralized in a group called the Federal Open Market Committee (FOMC). Though today the individual Reserve banks retain little independent power, the president of each can serve as a voting member of the FOMC. Further examination of the Federal Reserve will wait until later chapters.

When most people think of financial markets, they think of the stock market. A **stock** is a share in the ownership of a corporation, and through the stock market one can buy and sell ownership in most large businesses in the United States. The stock market has high visibility because it is a market open to anyone who can collect several hundred dollars together. However, the stock market is only a very small part of the total financial market, and plays only a minor role in macroeconomic theory.

Markets for debt are much larger than the stock market in terms of their daily transactions. These markets have less visibility because many require hundreds of thousands or even millions of dollars to enter directly. Some of these markets for debt do play an important role in macroeconomic theory. Whenever economists include an interest rate in their discussion, a market for debt is playing a role in their thinking.

There are many kinds of transactions which take place in the market for debt. Some transactions are highly publicized: when a big corporation issues marketable bonds with the aid of a brokerage house, the

brokerage house advertises the event to attract buyers. Transactions on the New York Bond Exchange are also widely publicized—they are reported in the financial section of major newspapers. Many more transactions involve financial intermediaries and less publicity. Sooner or later most people visit a bank (or a savings and loan association, which have grown to become very much like banks) to arrange a loan. Large corporations, small businesses, nonprofit groups, and individuals all use banks to obtain funds.

In addition to lending money to individuals and groups, there are other ways in which banks are part of financial markets. Banks borrow and lend funds among themselves in the federal funds market. They buy and sell foreign exchange. They buy and sell government and commercial debt. And finally, one form of bank debt serves as money in modern economies, and banks create this debt as a result of their financial transactions. This extremely important aspect of financial markets will be discussed in the next two chapters.

As do other markets, the debt market has prices. These prices are interest rates. An interest rate is the price one pays (or receives) for the use of funds for some period of time. Because they aggregate financial markets, economists often talk about "the interest rate." In fact there are many interest rates. Rates differ depending on factors such as the risk of default, the liquidity and time to maturity of the debt, and the tax status of the interest payments.

There are several interest rates which the press commonly reports. The **prime rate** was once the interest rate which large commercial banks charged their most credit-worthy customers for short-term loans. In recent years banks have usually given their best customers discounts from the prime, so this definition is no longer accurate. A good definition of the prime is hard to give other than it is the rate which banks publicize.

The **federal-funds rate** is the rate which banks charge one another for funds they borrow on an overnight basis. The **discount rate** is the rate at which commercial banks which have deposits at the Federal Reserve System may be permitted to borrow from a Reserve bank. Finally, the interest rate on 13 and 26 week treasury bills is used by many banks and savings and loan associations to determine rates which they pay on some of their accounts. This interest rate is probably the one most economists have in mind when they talk about "the interest rate." In practice all these rates tend to fluctuate together.

The market for government debt plays several roles in economic theory. Though U.S. savings bonds are the most publicized form of government debt, very little of the federal debt is financed with them, as Table 1 indicates. More of the debt is in the form of long-term debt (bonds), medium-term debt (notes), and short-term treasury bills, or T-bills for short. This last form is important because it plays a role in monetary policy which we will discuss in Chapter 10.

A T-bill is short-term debt of the federal government with a maturity of 13 weeks, 26 weeks, or one year. T-bills do not pay interest, but are bought and sold for less than face value and then redeemed at maturity at face value. Thus if one buys a six month T-bill with a face value of $10,000 for $9500, the effective interest rate is about 10% per year. The price of T-bills is determined by bids that buyers submit; the Treasury fills the highest bids first, and continues filling orders until its offering is sold out. The Treasury sells T-bills each week, but most of the proceeds are used to pay off the T-bills which are maturing.

Though some individuals buy T-bills, (you can buy one from any Federal Reserve Bank without any service charge—the Fed acts as a broker for the Treasury), most T-bills are bought by large companies, financial intermediaries, and governmental units. These organizations find them a safe and profitable way to invest funds available for short periods of time. The attractiveness of T-bills is enhanced by the **secondary** market which has developed. A secondary market does not sell newly-issued securities, but previously issued—or "used"—securities. (The stock and bond exchanges are examples of secondary

TABLE 1 DEBT OF THE UNITED STATES TREASURY
(end of 1985, numbers in billions of dollars)

Total	1,945.9
T Bills	399.9
Notes	812.5
Bonds	211.5
Savings Bonds and Notes	78.1
Other	443.9*
OWNERS OF THE DEBT	
U.S. Government Agencies and Trust Funds	348.9**
Federal Reserve Banks	181.3
Private Investors	1,417.2

Source: *Federal Reserve Bulletin*, February 1987, Table 1.41, p A30.

* Most of this category consists of nonmarketable debt held by U.S. government agencies and trust funds.

** The government holds its own debt because Congress has set up some programs which must keep their accounting separate from the rest of the government. An example is the Social Security system. When it has revenues in excess of its payments, it lends its excess funds to the Treasury Department, creating government debt which the government also owns.

markets.) The existence of this secondary market has made T-bills very liquid, that is, T-bills can be converted into cash quickly and cheaply. This secondary market is very large in terms of the dollar value of transactions, (about $10 billion in government debt changes hands on a typical business day), but because it does not deal in small transactions of $50000 or $100000, it is not visible. It is an **over-the-counter** market, which today means over-the-telephone. The center of the market is in the trading rooms of the largest New York banks. The market in T-bills is **deep**, which means that it can easily handle transactions worth many millions of dollars with no visible effect on price.

In addition to stock markets and the markets for debt, financial markets also include markets for foreign exchange and a variety of futures markets. The market for foreign exchange is an important market as far as macroeconomics is concerned, and we will examine it later in this chapter. Futures markets, in which two people agree on a price at which a future delivery will be made, are of lesser importance for macroeconomics.

PORTFOLIO CHOICE

A set of decisions which people constantly make and which often involve financial markets are those of **portfolio choice**. Portfolio choice involves decisions about the way we want to hold our assets (or to structure our liabilities). Students sometimes confuse portfolio choice with decisions to spend or save, decisions which are also important in

economics and which also usually involve financial markets. However, the spend-save decision is very different and will be discussed in later chapters.

Portfolio choice is a fancy term for something we do all the time. For example, a yard sale is an example of portfolio adjustment. When people decides to have a yard sale, they attempt to exchange assets in the form clothing and household items for another asset, cash. Usually the reason that people holding a sale want to make this exchange is that they no longer have much use for the items they are selling. As a result, they want to change the form in which they hold assets.

From a macroeconomic perspective, most important cases of portfolio adjustment involve financial assets. When we look at financial assets, there are three characteristics which most people want to have in their assets. First, they like assets with low risk. Second, they want assets which are liquid. Third, they like assets which give them a high rate of return. Unfortunately, there are no assets which combine all three characteristics. People face tradeoffs. If they want a higher return, they usually have to accept more risk or less liquidity. For example, over the past half century the average return on holding common stocks has been higher than the return on holding passbook savings in a bank. However, the high average return on common stocks is the result of some stocks performing very well, while others perform poorly. Investment in stocks can be quite risky.

Many issues in portfolio choice can be illustrated with a **balance sheet**. A balance sheet is based on the definition of net worth or wealth:

(1) Net Worth = Assets - Liabilities

An asset is what one owns and a liability is what one owes. Using very elementary algebra, one can rewrite this equation as:

(2) Assets = Net Worth + Liabilities

Since this equation is based on a definition, the right-hand and left-hand sides *must* balance, and hence the name balance sheet.

We will use balance sheets in upcoming chapters to analyze financial transactions. To give you some taste of what is to come, consider the Table 2 which shows balance sheets of a hypothetical commercial bank and one of its customers. The bank has as its liabilities the deposits of its customers. These are amounts which the bank *owes* to them. On the other hand, these deposits are assets for the customers. The loans the bank makes to consumers and businesses are assets to the bank, and liabilities to the consumers

TABLE TWO
HYPOTHETICAL BALANCE SHEETS

COMMERICAL BANK

ASSETS	LIABILITIES & NET WORTH
Vault cash $1,000,000 loans $9,000,000	checking deposits $4,900,000 savings deposits $4,900,000 net worth $200,000

GERMAINE

ASSETS	LIABILITIES & NET WORTH
deposits at bank $400 car $3000 personal items $2000	loan from bank $2000 net worth $3400

and businesses.

Suppose that Germaine, the bank customer, decides to deposit into a savings account some of the cash she has in her piggy bank. The effect on the bank will be to increase its vault cash on its asset side and also to increase its savings deposits on its liability side. For Germaine, the transaction will not affect the liability side of her balance sheet at all. She will reduce her cash holdings and increase the amount she has in her savings account. As a result of this portfolio decision which Germaine makes, she will earn a higher return on her assets than she did before, but she will have slightly less liquidity. In Chapter 10 we will suggest that the bank may want to make portfolio changes as well as a result of this deposit.

SPECULATORS AND MARKETS

An important concept which economists use in discussing financial markets is the concept of "efficient markets." In an efficient market prices take into account all knowledge which people have about that market. (Notice that the use of the word "efficiency" in this context is not the same as the use of the word in most of microeconomics.) If there is knowledge which is not being used, then there are unexploited profit opportunities, and economists do not believe that such opportunities can remain unexploited for long. If one knows that a stock or bond is undervalued and that it will rise in value, one will make a large amount of money by buying until it does rise. Because profit opportunities are quickly exploited once they become known, one cannot "beat" an efficient market unless one has special information that is unavailable to others.

Suppose that you receive an advertisement in the mail offering you a book that tells you how you can beat the market and become rich. If this book is offered to you for a mere $500, should you buy it? The idea of efficient markets suggests that you should be very, very suspicious. If there was a way to beat the market, the person who had the way should keep quiet and use it. Once the method becomes publicly known, its use will eliminate any source of profit.

If the stock market is an efficient market, movements of stock prices from day to day will be random. Knowing the past movements of the stock does not help one predict what the future price will be. This idea contradicts the technique of picking stocks which "chartists" or "technicians" use. They believe that past movements can reveal patterns. A variety of studies which have compared randomly picked portfolios of stocks with stocks chosen by various technical rules supports the idea that information about past movements of stock prices does not help predict the future. The idea of efficient markets suggests that one should not place a great deal of faith in any forecasts about interest rates or stock prices, because if the person making the forecast really does know what will happen, he could keep quiet and get rich.

In an efficient market prices adjust very quickly to new information. In such markets speculators play a useful role. They are coolly rational individuals looking at the fundamental values of items, buying when prices are too low and helping lift these prices, and selling when prices are too high and helping to lower these prices. As a result, prices correctly transmit information about values which people can then use to make decisions. An efficient market will not be the source of economic disturbances. It can, however, transmit disturbances, and this alone would be enough to interest economists.

However, there are some who argue that financial markets are not efficient and do not always adjust to economic conditions. They argue that those trading in financial markets are not always calmly rational in the way that those who believe in efficient markets picture them. Rather traders can go on speculative binges, ignoring reality. An important reason people buy items in financial markets is in the hope of selling them at a profit. Thus

trading in these markets involves not only an analysis of the fundamental value of an asset, but also an analysis of how other people will react. If people are confident that others will buy the item for more than they paid for it, then they will buy it even if it has little value to them.

The idea described above has been called the "greater-fool" theory. It implies that although one may be a fool for buying an asset that is overpriced, one will profit if there still are greater fools who will pay even more for it. The idea is an example of the model of contingent behavior described in Chapter 2. In contingent behavior, people's actions are based on the way they expect others to act. To the extent that people act in this way and that "greater-fool" speculating influences prices in financial markets, financial markets can serve as a source of economic disturbances rather than as mere transmitters.

There are many cases in which markets clearly were on speculative binges. One of the earliest and most famous was the Dutch tulip market of the 1630s. The tulip was introduced into Holland in the middle of the 16th century from Constantinople. It immediately became a status symbol among the very rich, and then as it became a bit less rare, among the middle classes. According to Charles Mackay, "Until the year 1634 the tulip annually increased in reputation, until it was deemed a proof of bad taste in any man of fortune to be without a collection of them."[1]

After 1630 the price of tulips reflected not only their stylishness, but also speculation. People began to gamble on price changes. As people began to join the speculation, trying to get in at low prices, prices took off and the market developed a life of its own. People bought tulips at ridiculous prices only because they thought other people would be willing to pay equally ridiculous prices. For example, a single bulb was exchanged for twelve acres of land. Another was sold for a carriage, two horses, and a substantial sum of cash.

The "bulls"—those who expected rising prices—ruled the bulb market until 1636. The boom faded when enough Dutchmen began to wonder if tulip bulbs were really worth what they were being traded for. They decided to get out of the market while they were ahead. As this sentiment spread, the market peaked and began to fall. Speculative markets can crash even faster than they rise because once they begin to fall, people realize that there is no fundamental reason for prices to be so high. The fall in prices of tulip bulbs continued until they reached a realistic value, which meant that a single bulb was almost worthless.

Looking back at tulipmania, we have a tendency to think, "That is a funny episode, but of no importance. People are smarter today." Yet in 1982 a major speculative binge came to an end, leaving debts in the area of $90 billion. The binge took place in Kuwait in an unregulated over-the-counter market called the Souk al-Manakh. The market was limited to trading in only about 35 companies, most of which were small, and many of which did not even publish annual reports. Activity was clearly speculative, and as prices rose and banks began to refuse to lend money to finance deals, people began to use postdated checks. In effect, people promised to pay based on the belief that they could sell their securities for more than they had paid, and thus redeem the check. Under Kuwaiti law, a check is payable on demand regardless of the date. The collapse came in August of 1982 when someone demanded early payment on a check which could not be paid. With confidence in the system shaken, prices quickly collapsed.[2]

Markets based on the "greater-fool" theory always collapse. Eventually the greatest fool is found, and once he is found, the process cannot continue. In many ways a

2. *Extraordinary Popular Delusions and the Madness of Crowds* (L.C. Page, 1932, page 89; original edition published in London, 1841.

2. For more details, see *The Wall Street Journal*, Dec 2, 1982.

speculative binge is like a chain letter. Everyone involved in a chain letter believes that he or she will get rich. But since all that is involved is a reshuffling of money, (or in technical jargon, a chain letter is a zero-sum game), if someone does get rich, others must get poorer. Like speculative binges, chain letters die when the greatest fools have found and joined the chain.

Speculative binges can affect the production of an economy if they cause enough financial disruption. They will cause bankruptcies, reduce people's trust in others, and cause unemployment for the people who became speculators. However, few periods of inflation or recession can be linked to speculative binges, and, as a result, most economists do not believe that they, or the financial markets, are an important source of macroeconomic disturbance.

Some people argue that the Great Depression was a result of a speculative binge in the stock market in 1928 and 1929. Most economists dismiss this theory because prices in the stock market did not reach levels that were clearly outlandish. Some market watchers have even argued that stock prices were not overvalued at all in 1929 if the 1930s would have been a normal decade.

Even if one believes that stocks were overvalued in 1929, and that the stock market had gone on a speculative binge, it is hard, and perhaps impossible, to explain why the results of this particular binge were so much more severe than the aftereffects of other, equally large binges in the stock market. In particular, the very large drop in stock market prices on Monday, October 19, 1988 left few traces on production or consumption during the following year. Yet on that one day the value of common stocks, as measured by the Dow Jones Industrial Index, drop by more than 22%. Clearly a speculative crash in financial markets is not enough, by itself, to trigger a recession.

THE MARKET FOR FOREIGN EXCHANGE

The market for foreign exchange involves the buying and selling of one country's money for another's. If, for example, you decide to travel to Thailand, you will need to buy some *bahts*, the currency of Thailand, either before you go or once you get there. In your transaction, you will supply dollars to the foreign exchange market and demand bahts.

The foreign exchange market provides one of the best illustrations of how a financial market can transmit disturbances. The market is usually considered to be an efficient market, not subject to runaway speculative binges. The heart of the market is the trading by a number of very large banks. A trade worth a million dollars is very small in this market, but it is the prices of these very large bank transactions which newspapers report when they publish exchange rates. When you deal in smaller amounts when you travel to Thailand, you will get less favorable prices.

The market for foreign exchange can be analyzed in terms of supply and demand. Americans demand foreign money (and supply dollars) when they buy things abroad, such as vacations, goods, services, factories, and financial assets. Foreigners supply foreign currency (and demand dollars) when they buy things here, such as vacations, goods, services, factories, and financial assets. Though when you buy a Japanese camera, you do not deal in the foreign exchange market, someone did in the process of bringing the camera to you. It may have been the American importer, who would have sold dollars to buy yen, and then used the yen to buy the camera. Or it may have been the Japanese exporter, who sold cameras for dollars and then sold the dollars for yen. In either case, dollars were supplied to the foreign exchange market and yen were demanded.

The exchange rate, or the price of foreign money, is an important price when we buy

things made in other countries. For example, the manufacturer of the camera in the previous paragraph paid its workers in yen. The camera has a yen price. Suppose the price of the camera in yen is 50,000 yen. How much will this camera cost in terms of dollars? To determine this, we must know the value of yen in terms of dollars, or the exchange rate. Suppose one dollar is worth 250 yen. Then to find the value of the camera in dollars, we can use equation 3:

(3) Dollar price = exchange rate x yen price

or:

(4) Dollar price = (number of dollars/ number of yen) x yen price.

Substituting the values we have we find:

$$\text{(5) Dollar price} = \frac{\$1}{250 \text{ yen}} \times \frac{50{,}000 \text{ yen}}{1 \text{ camera}}$$

Canceling out where we can gives us:

(6) Dollar price = $200/1 camera.

Two things affect the price of the Japanese camera as seen from America. The first is the yen price of the camera, and the second is the dollar price of the yen. If either one increases, Japanese cameras will become more expensive, and Americans will want fewer of them. The exchange rate also affects the price of American goods as seen in Japan. One can use the same equation to compute what the yen price of a bushel of soybeans will be if the dollar value is $10. Substituting into equation 4 we get:

(7) $10/1 bushel of soybeans = ($1/250 yen) x yen price.

Ninth grade algebra tells us to divide through by the exchange rate to get the equation into the form:

(8) ($10/1 bushel of soybeans) x (250 yen/ $1) = yen price.

Solving gives us

(9) 2500 yen/1 bushel = yen price,

or that a bushel of soybeans will cost 2500 yen.

Figure 1 shows a supply and demand graph for foreign exchange. When foreign currency is cheap, foreign products are cheap in dollars, and Americans will want a lot of them. To buy these foreign products, Americans must buy a lot of foreign exchange. When the price of foreign exchange is expen-

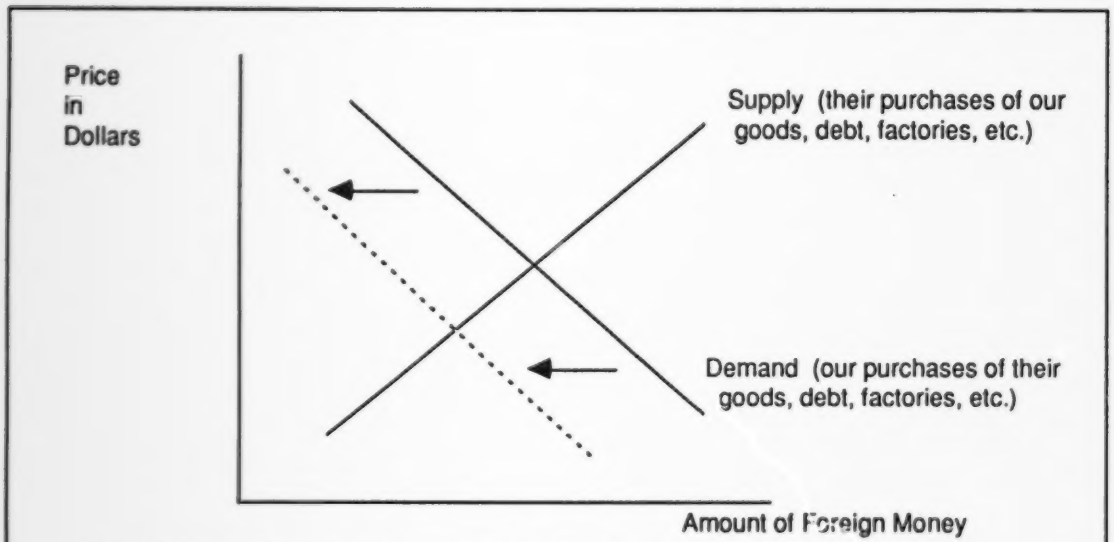

Price in Dollars
Supply (their purchases of our goods, debt, factories, etc.)
Demand (our purchases of their goods, debt, factories, etc.)
Amount of Foreign Money

Figure 8.1 The Supply and Demand of Foreign Exchange

sive, so also will be foreign products, and Americans will not want many. Hence they will not need as much foreign exchange. Thus the demand for foreign exchange will have a negative slope, as demand curves are supposed to have. Unfortunately, we cannot show that the supply curve has a positive slope with this reasoning, (recall that there is no law of supply), but a positive slope is not unreasonable. (The demonstration of conditions needed to get a positively sloped supply curve is beyond the scope of this course.)

Let us consider what will happen if the United States increased its tariffs. Because tariffs are taxes on imports, foreign products will become more expensive for Americans. As a result, Americans will want to buy fewer imports. (This is usually the desired result of tariffs). However, if the exchange rate is a **floating rate**, that is, one which can take whatever value supply and demand dictate, the story has not ended. As a result of the tariff and the resulting decrease in imports, the demand curve for foreign exchange shifts to the left. As a result, foreign money becomes cheaper for Americans and American dollars become more expensive for foreigners. If dollars become more expensive, foreigners will find American goods more expensive. (You can check this by seeing what the yen price of soybeans becomes if the dollar rises in value so that it is worth 300 yen.) As dollars become more expensive, foreigners will reduce the amounts which they buy from us. The end effect of a tariff with floating exchange rates, then, is to cut not just imports, but to cut *exports* as well. This latter effect is a totally unintended consequence but one which illustrates how financial markets can transmit effects from one place to another.

FIXED EXCHANGE RATES AND THE BALANCE OF PAYMENTS

If a country treats the market for foreign exchange as any other market, and lets the marketplace determine the price of foreign money, it has a system of floating exchange rates. This is what most of the Western world has had since the 1970s. However, governments often fix prices in this market. In doing so they simultaneously establish price floors and price ceilings—they will neither let the price rise nor fall (except within a small range). When governments fix or peg the exchange rates, they change the way in which the market for foreign exchange transmits disturbances from one sector to another. We will see in later chapters that the decision by a government to peg or float exchange rates greatly influences the effects of government actions on the economy.

There are two ways a government can keep exchange rates fixed. One method which is very common in less-developed nations uses controls. Governments using controls almost always set the price of foreign exchange below the market-clearing price (which means that they price their own currency too high), and thereby cause a shortage of foreign money. The government prevents the market increasing price to eliminate this shortage by outlawing private transactions in foreign exchange. The law orders all citizens who obtain foreign exchange to sell it to the government. Because the government becomes the only legal source of foreign money, those who want to buy products from abroad must obtain those funds from the government, which rations these funds to those purposes it deems most worthy. Though this system is hard to justify on economic grounds, and is often evaded with extensive black-marketing, the system gives rulers a powerful tool to reward friends and punish

enemies.

This first method is called a **fixed and unconvertible** exchange rate because the exchange rate is fixed, but domestic money cannot be freely converted into foreign money. The second method is a **fixed and convertible** exchange rate. With this method a government does not abolish the private market for foreign exchange, but fixes exchange rates by standing ready to absorb any surpluses or to fill any shortages. During the 1950s and most of the 1960s, for example, the United States pegged the dollar to gold ($35.00 was equal to one ounce of gold), and most other countries had pegged their currencies to the dollar (the German Mark was fixed at four marks equal to one dollar for much of this time). The U.S. government would buy or sell gold at $35.00 per ounce to foreign governments on demand, and the German government would buy and sell dollars at a price of four marks per dollar.

Supply and demand analysis tells us that if the price of foreign exchange is set above the market-clearing price, there will be a surplus. At this price people will want to sell more foreign exchange than they want to buy. The government can prevent this surplus from lowering price by stepping into the market and buying the excess foreign exchange. On the other hand, if the price which the government sets is below the market-clearing price, there will be a shortage (called a balance of payments shortage). The government can prevent the shortage from raising price by stepping into the market and selling foreign exchange. The government can obtain this foreign exchange from reserves it stored up when there was a surplus, or by borrowing from other countries, or by selling

TABLE 3 BALANCE OF PAYMENTS STATISTICS FOR THE UNITED STATES, 1966
(Amounts in millions of dollars)

Sources of Foreign Exchange	Uses of Foreign Exchange
Exports of Goods and Services $43,142	Imports of Goods and Services $38,063
	Remittances and Pensions 1,015
Balance on goods, services, remittances, and pensions	*+4065*
	U.S. Government grants, net 3,444
Foreign Capital Flow, net 2,532	U.S. private Capital Flow, net 4,298
	Errors and Omissions 210
Balance of all of the above	*-1357*
Change in U.S. Reserve Assets 568	
Change in Liquid Liabilities of Foreign Accounts 789	

Source: *Federal Reserve Bulletin*, April 1969, pp A70-71.

assets such as gold. It should be obvious that a government can only fill a shortage temporarily. If a balance of payments shortage runs for too long, a country will run out of foreign exchange to provide to the market.

In the real world we cannot observe the supply and demand curves for foreign exchange. Deciding whether the price at which the government has pegged its currency is too high or too low is a problem. In an attempt to measure the gap between the supply and demand curve, countries collected **balance of payments statistics.** Balance of payments statistics balance because some use is found for each unit of foreign exchange provided, and each unit of foreign exchange used has a source.

To estimate the gap between the supply and demand curve, the government first tries to measure all the uses and all the sources of foreign exchange. The government then attempts to separate those sources and uses of foreign exchange which take place naturally at the existing prices from those which are *accommodating*. For example, to maintain a price above equilibrium in Figure 1, the government could sell some of the foreign exchange (or gold) it owned, or it could borrow from other countries. These sources of foreign exchange would be accommodating. In practice measuring the gap is very difficult and several different ways of computing it from the statistics have been developed.

Table 3 illustrates what the Balance of Payments can tell us by showing data for the United States for 1966. Exports of goods and services include spending by American tourists abroad and also earnings that Americans receive from investments abroad. Both are payments for services. Remittances sent abroad and U.S. government grants are similar in that there is no flow of goods in return for them.

Capital flows represent purchases of foreign assets in the form of factories, foreign stocks and bonds, and debt of foreign governments. In 1966 the United States was exporting capital, that is, Americans were investing more in other countries than foreigners were investing in the United States. The errors and omissions category reflects the fact that these numbers are estimates, and this category will take whatever value needed to make sources balance uses.

The negative balance of -1357 suggests that in 1966 Americans wanted to use more foreign exchange than foreigners were supplying to the market. To keep the price of the dollar from falling, the U.S. government reduced its holdings of gold and foreign reserves, and foreign governments increased their holdings of U.S. dollars in the form of U.S. government debt, supplying foreign exchange as they did so. The first of these accommodating sources represents a form of *dissavings*, and the second a form of *borrowing*. Just as an individual cannot borrow and dissave forever, neither can a nation. (See question 8 below.) The balance of payments deficit which these figures indicated was a warning to the United States that there were problems in its transactions with the rest of the world and that policy changes were in order. The policy change which the United States ultimately took was to abandon fixed exchange rates.

SUMMARY

This chapter began our exploration of aggregated markets by looking at financial markets. The first part of the chapter looked at some basic concepts of financial markets. It then looked at the role of speculators in financial markets and introduced the concept of efficient markets. Finally, it examined the foreign exchange market, explaining the differences among floating, fixed and unconvertible, and fixed and convertible exchange rates.

This chapter showed that financial markets play an important role in macroeconomic theory because they provide a major way in which changes in one part of the economy can be transmitted to other parts. It showed how this can happen in one particular market, the market for foreign exchange. There we saw that a tariff designed to protect jobs in one part of the economy could cost

people their jobs in another part. But such transmission is not limited to questions of tariffs and is not limited to the market for foreign exchange. All financial markets transmit.

QUESTIONS

1. Arrange these assets from the most liquid to the least liquid: cash, old master paintings, U.S. savings bond, bonds of AT&T, passbook savings account at a bank; Kruggerands; medical school training.

2. Update Table 1 with the most recent available figures.

3. Jane Doe finds that she needs more cash. She goes to her bank and withdraws $500 from her checking account. As a result she now has $500 more in currency and $500 less in her checking account. Show the changes this transaction has on her bank's balance sheet:

Jane's Bank

Assets	Liabilities
Vault Cash ____	Checking Accounts ____
Deposits at the	Savings Accounts ____
Fed. Res. ____	Other Liabilities ____
Loans ____	Net Worth ____
Securities ____	
Other ____	

4. Check the financial section of the newspaper to find the price of British pounds and German marks. From your answer, compute the number of British pounds needed to buy 100 marks.

5. You are the ruler of a country which has exchange rate controls. You find the views of one of the major newspapers irritating. The head of your secret police suggests that a few killings and beating will solve your problem. Your director of public information suggests that you impose censorship. Your economic advisor, however, tells you that newspapers must import the paper they use. As a result, he knows a way to silence this opposition which will not be noticed by human-rights organizations. What will he suggest?

6. a. If one dollar is worth four marks and one Volkswagen is worth 16000 marks, what is the dollar price of a Volkswagen?
b. If the mark becomes more expensive, so that a dollar buys only two marks, what will happen to the price of Volkswagens in terms of dollars?
c. If one dollar buys two marks, what is one mark worth?
d. Will Americans want more marks when they cost $.25 or when they cost $.50?

7. When you travel to Europe, are you demanding or supplying dollars in the market for foreign exchange? Are you demanding or supplying European currencies?

8. Below is a table showing the sources and uses of funds for the John Doe family. Just as the Balance of Payments statistics shows the financial transactions a nation has

with the rest of the world, these statistics show the financial transactions the Doe family has with the rest of the world.

Sources of Funds		Uses of Funds	
Wages, Interest and Dividends	$10300	Consumption Spending	$8700
Reduction in Savings Accounts	1000	Taxes	1200
Loan from a credit union	1300	Investment in the stock market	2000
		Errors and Omissions	700
Totals	12600		12600

a) What items in Table 2 correspond to items in this table?

b) Based on these numbers, is the Doe family in good financial condition? Does the Doe family have a situation similar to a balance of payments deficit or surplus?

c) Suppose that in the above table consumption spending were $10,700 and investment in the stock market became zero. How would your answers to part b change?

d) Suppose that taxes increase. Will anything else change? Why or why not? If something else changes, can you tell what will change?

e) Suppose the United States places a tax on imports to discourage them. Will anything in the Balance of Payments table change other than imports? Why or why not?

9. Here are balance sheets showing the assets, liabilities, and net worth of Jack and Jill:

Jack		Jill	
Assets	Liabilities & Net Worth	Assets	Liabilities & Net Worth
Cash $2000 Value of personal items $800	Net Worth $1000	Cash $10 Value of personal items $500	Student loan $200 Net Worth ___

a) What number belongs in Jill's Net Worth?

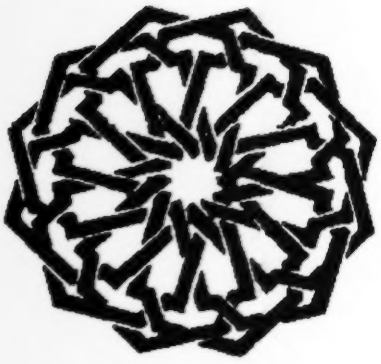
b) Suppose that these are their balance sheets immediately prior to the U.S. presidential election of 1976. Jack bets Jill $20 that Gerald Ford will win. After the results are in, but before the bet is paid, what will their balance sheets look Like? (Hint: You must add new categories to these balance sheets. Do what is logical.)

10. The random walk theory of the stock market says that there is no pattern in stock prices. Yet if you look at the movements of stock prices, they do not appear to be random. There appears to be long periods in which stocks increase in value, followed by long periods in which they decrease.

Consider the following experiment. Suppose you have an imaginary stock priced at $50.00. Now flip a coin. If you get heads, reduce the price of your stock by $.50; if you get tails, increase it by $.50. Repeat 100 times, each time recording the new price of the stock. Now take your record of stock prices and plot them on a graph. To what extent do they look like the record of the prices of actual stocks?

11. In the past the United States had a pegged exchange rate. With this system the balance of payments deficit or surplus is important, and the United States for many years had a deficit. Indicate whether each of the following events would increase or decrease a deficit.

A reduction in U.S. military personnel stationed abroad.
Export subsidies in foreign countries.
An American tariff with retaliation by other countries.
A German devaluation (Germany would lower the price at which it fixed its currency).
An inflation in Europe.
A Mexican quota on all American items.
Inflation in the United States.
A fall in per capita income in the United States.



CHAPTER 21

MONEY MATTERS

After you finish this chapter and work the questions at the end, you should be able to:

Define money.
Describe the components of money in the United States.
Distinguish between a stock and a flow.
Explain why the store-of-wealth function of money is important.
Distinguish between income and transactions velocity.
When given any two of money, velocity, and spending, compute the third.
List the assumptions of the quantity theory of money.
Distinguish between the long run and the short run.
Explain how the quantity theory explained gold flows among nations.

The last chapter showed why few economists see the financial markets as the source of macroeconomic instability. In contrast, many economists believe that the market for money balances is an important source. These beliefs form the oldest thread of macroeconomic theory, dating back to the 16th century. This chapter will explore what money is, and why it is so important in macroeconomics.

WHAT IS MONEY?

Economists often use words in ways that are not quite the same as the way the words are used in everyday speech. "Money" is such a word. In everyday speech we use the word "money" in a variety of ways, such as: "My father makes a lot of money," or "John Paul Getty had more money than anyone else," or "General Motors made twice as much money this year as last." In the first sentence above the word money could be replaced with income, in the second with wealth, and in the third with profit or net income. None is the way economists usually use the word "money." The economic definition emphasizes that money is the **medium of exchange**, or what we use to buy things with.

Economic activity can take place without money. All transactions can be **barter** transactions in which people obtain a good or service they want by trading away some other good or service which they value less. Because barter is inconvenient, barter systems exist only when exchange is uncommon. Suppose we have the mini-economy in Table 1. If Crusoe visits Friday to buy coconuts, a trade may not take place. Crusoe wants coconuts, but Friday does not want fish. Exchange will take place only when one of the three realizes that he will have to accept something he does not want but which he can trade later. With only three people and three commodities, this realization will soon take place. However, if there are a hundred people with a hundred different commodities, the pattern of barter transactions necessary for everyone to end up with what he or she wants may be so complex that trade may not occur. As trading patterns become more complex, groups need to find a way to reduce the cost of making transactions. They spontaneously begin to use one commodity as an intermediary: they invent money.

The invention of money makes trading easier. With money, all prices can be expressed in the same way, in terms of how much money is needed to buy the product. The unit of money becomes the measuring stick of value, or what economists call the **standard of value**. With a standard of value, computing the costs and benefits of various options, that is, making choices, becomes easier.

A standard of value is most useful when it does not change over time. If the measuring stick changes with time, comparing costs and benefits of some options may be more difficult. Inflation or deflation change the measuring stick, and Chapter 5 argued that a major reason people do not like inflation is that it makes comparing options over time more difficult.

In addition to its function as a medium of exchange, money can also serve as a **store of value**. Though this function is not what gives money its special importance in macroeconomics, this function is very important in

TABLE 1 A BARTER ECONOMY

	Has	Wants
Crusoe	Fish	Coconuts
Friday	Coconuts	Bananas
Saturday	Bananas	Fish

explaining how much money people want to hold. Any item which people consider as a way of holding wealth is a store of value. Land, stocks and bonds, old paintings, factories, and jewelry are just some of the other ways people can hold wealth. When money is a good way to hold wealth compared to these alternatives, people will want to hold a lot of it. On the other hand, when money is a poor way to hold wealth, people try to keep little of it. For example, in the German hyperinflation people tried to spend money as soon as they got it because it lost value so quickly. This idea, that people will be willing to hold large amounts of money when it is a good store of value, but will try to hold as little as possible if it is a poor way to hold wealth, is an idea which we will see frequently in the next few chapters.

Because money reduces the costs of making transactions, all societies which have any amount of exchange have developed money. They have used many things as money, including salt, cattle, pigs, goats, tobacco, gold, iron, and bank debt. An item serves as money when everyone is willing to take it in exchange. For example, in World War II cigarettes served as money in prisoner-of-war (POW) camps. Most transactions involved cigarettes, and even people who did not smoke were willing to sell items for cigarettes. Cigarettes did not become money because someone in authority ordered that they be money. Their use as money arose spontaneously because, of the items available, they best served as money. They were limited in quantity, durable, and a pack could be split up for small purchases. To decide what should be counted as money, one must observe what it is that people spend.

What serves as money in the U.S. economy? Paper money and coin certainly do because we spend them. So do travelers' checks. But these forms of money are less important than deposits against which we can write checks. The amounts in checking accounts are about two and a half times as big as the total of currency, coin, and travelers' checks. Yet even this statistic overstates the importance of currency and coin. Only small transactions are made with currency and coin, and the total spending done in this form is probably only about 1% of total transactions. For larger transactions, most people write checks. However, for very large transactions in the millions of dollars, checks are not used but funds are electronically wired from bank to bank over telephone lines. These **wire transfers** of funds, according to an article in the *Business Review* of the Federal Reserve Bank of Philadelphia in January-February of 1985, average over $600 billion on an average business day. Perhaps as much as 75% to total transactions in the economy, when measured in dollar value, are made with wire transfers.

There is dispute among economists if anything else should be counted as part of the U.S. money stock. Some economists believe that since savings accounts are almost like checking accounts, representing funds which can be quickly obtained and spent, they too should be counted as money. As a result, there are several different measures of money which the Federal Reserve publishes.

The narrowest definition of money, called the M-1 definition, includes only the public's holdings of coin, currency, travelers' checks, and deposits against which checks can be written. This definition emphasizes the medium-of-exchange definition of money. Notice that when the government or banks hold these items, they are not counted as money; the government is not part of the public.

Broader definitions of money add some very liquid assets such as savings accounts to the M-1 definition. Though debate about what should count as money are very old (with roots in the 19th century), the drastic changes in the financial sector in the late 1970s and early 1980s have made the debate especially confusing. There has been a large increase in deposits which both earn interest (and thus are very much like savings accounts) and against which checks can be written. This difficulty of deciding what should, and what should not, be counted as

money is a major problem for theories which argue that much macroeconomic instability comes from the market for money.

When we measure money, we are measuring a **stock**, not a **flow**. A stock variable is one which has meaning at a point of time, while a flow variable only has meaning over a duration of time. One can talk about the amount of money one had at 12:00 on October 26, 1983, but one cannot talk about the amount of income one earned at that time. Income needs a time duration: there is weekly income, monthly income, and yearly income. Accountants separate stocks and flows with balance sheets and income statements. The first is a statement of stock variables and the second of flow variables.

THE EQUATION OF EXCHANGE AND THE QUANTITY THEORY

Those who stress the importance of money as a source of economic disturbances begin by noting that money enters into all transactions. All purchases and sales involve money. The Wheel of Wealth in Figure 1 illustrates this simple idea. The flow of money circulates counterclockwise and is matched by a flow of goods, services, and resources moving clockwise.

One can think of the flow of money as a flow of a river. The amount of water past a point on the bank depends on the amount of water in a cross-section of the river multiplied by the velocity at which that cross section flows. In a similar way, spending in the circular flow can be found as:

(1) Amount of Money x Velocity of Circulation = Total Spending

Equation 1 is called the **equation of exchange** and is always true by definition. If an economy had $5.00 of money, and each dollar was spent four times a month, total monthly spending must be $20.00. (Note that total spending excludes barter transactions—trading one commodity for another with no money involved. If barter were included, the equation of exchange would not be true.)

The equation of exchange is a foundation on which the **quantity theory of money** is built. The quantity theory of money is a theory of the price level. It argues that inflation is caused by rapid increases in the quantity or money in circulation, and that

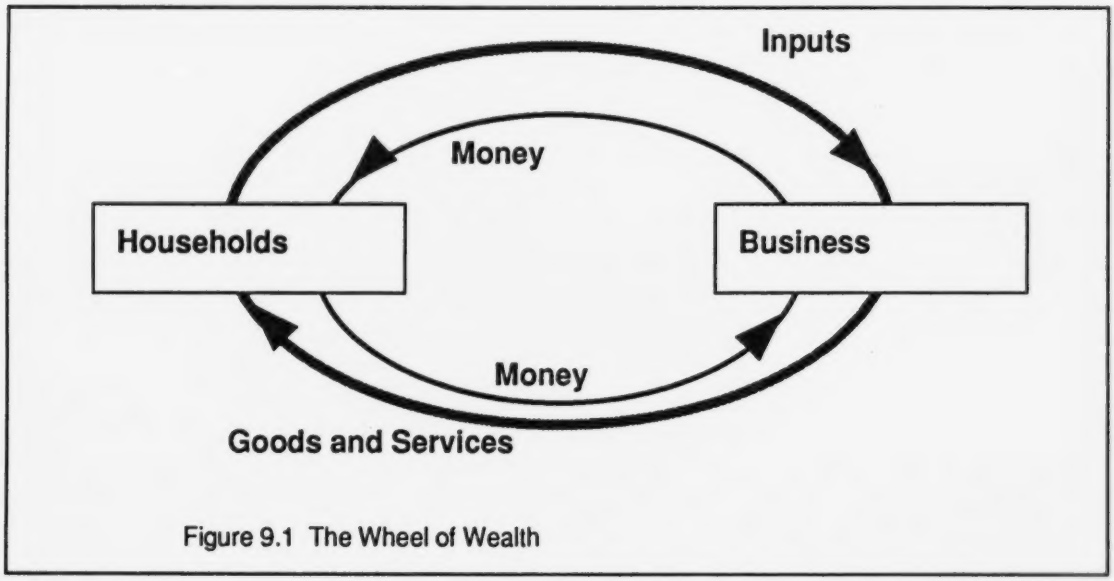


Figure 9.1 The Wheel of Wealth

deflation is caused by decreases or very slow increases in the quantity of money in circulation.

Notice that there is a difference between the equation of exchange and the quantity theory. The equation of exchange holds by definition. We get the quantity theory only by adding certain assumptions about what is cause and what is effect. The process of making assumptions began in the 16th century with the argument that the inflow of gold and silver from the Americas was causing inflation in Europe. The Spanish conquistadors who followed Columbus to the Americas desired gold and silver, and they obtained large amounts both from plundering the Aztec and Incan empires and from mining. Much of the gold which the Spanish sent back to Europe was coined. The amount of money in circulation rose, and at the same time prices began a slow, century-long rise.

Intellectuals such as John Locke and David Hume further refined the quantity theory. However, the best early statement is probably that of an English banker, Henry Thornton, in 1802. In the early 20th century the American economist Irving Fisher popularized the equation of exchange in its mathematical form (though in his version, Fisher separated currency from checking account money, a distinction which no one makes any more). Fisher, an economist who taught at Yale University, wrote extensively on money, interest rates, index numbers, and why prohibiting the sale of alcohol would make American workers much more productive. Basic ideas of the quantity theory continue to thrive today under the name **monetarism**.

To make the quantity theory work as a theory of price level, one must clearly distinguish between what happens in the long run or in equilibrium, and what can happen in the short run or in the adjustment process. The adjustment process describes what happens as the economy moves from one position of long-run equilibrium to another. Recall that Chapter 7 said that there were two questions we want to ask about each aggregated market: is it a source of disturbance, and does it have adjustment problems. The quantity theory in its original form ignores all adjustment problems, which is a legitimate way to proceed if only the long run is of interest.

Writing in 1802, Henry Thornton clearly states the central tenet of what the quantity theory suggests for equilibrium. An increase in the amount of money, he says, will neither be held idle nor greatly increase the amount of production. Thus

> "There remains...no other mode of accounting for the uses to which the additional supply of it can be turned, than that of supposing it to be occupied in carrying on the sales of the same, or nearly the same, quantity of articles as before, at an advanced price the cost of goods being made to bear the same, or nearly the same, proportion to their former cost, which the total quantity of paper at the one period bears to the total quantity at the other."[1]

Thornton implies that total spending is made up of two parts, a price part and a quantity part. One hundred dollars of spending can buy either 25 units of output at $4.00 each, or 50 units of output at $2.00 each. In terms of the equation of exchange, this is usually written as:

(2) MV = Spending = PT

where P is a price level and T is the number of transactions.

If the amount of money in circulation doubles, the quantity theory predicts that, once in equilibrium, the price level will also double (or close to it), and that if the amount of money in circulation is cut in half, the price level will be (about) one half its former value after all adjustments have taken place. An alternative way of viewing this is to recognize that as prices go up, the value of money goes down, or since it takes more dollars to buy things, money is worth less (not worthless, however) than it used to be. The quantity theory states that an increase in the amount

[1] *An Enquiry into the Nature and Effects of the Paper Credit of Great Britain*, 1802, reprinted by August M. Kelley, 1965, p. 241.

of money relative to goods decreases its value, and a decrease in the amount of money relative to goods will increase its value. Money is thus like any other commodity: increases in supply decrease value.

The quantity theory implies that a number of interactions are not possible. First, the quantity theory assumes that changes in spending do not simply cause proportional changes in the money stock. It is changes in money stock which are the cause, not the effect. In the jargon of economists, money is an **exogenous** variable, one determined by forces outside the model.

Second, the quantity theory assumes that the value of velocity is not dependent on either the amount of money or on the price *level*. (Care must be taken here, because this does *not* mean that velocity is unaffected by *changes* in price level. However, if price level is changing, the system cannot be in equilibrium. Recall that the assumptions we are discussing are assumptions of what happens in equilibrium.) Changes in velocity are possible, however, due to factors such as changes in transportation, new financial institutions, or other exogenous factors.

Finally, the quantity theory assumes that T, or the number of transactions, is determined by the availability of labor, capital, natural resources, knowledge, and organization. The quantity theory assumes not only that markets clear in equilibrium, but that any adjustment problems are small enough to ignore. If there are unemployed resources, then the prices of those resources should be dropping, which means that the economy is not in equilibrium. Only when the price in each market has reached a point at which the quantity supplied equals quantity demanded will the economy be in equilibrium, and in this situation there will be no resources which cannot find employment. In other words, the quantity theory assumes that in the long run the economy tends to full employment. (A modern quantity theorist might make some modifications to this conclusion to take into account modern theories of search which imply that with less than perfect information there is some "natural" level of frictional unemployment. We will discuss these theories in Chapter 13.)

Money is not a resource that results in the production of output. It is not like labor or raw materials or machines. More money does not act as an input that increases output. However, the quotation from Thornton does not say that prices move in exact proportion to money. It is possible that the adjustment process can influence the amount of machinery available, and thus a change in money can have long-run influences on the amount of transactions. All quantity theorists, however, believed that any effects of this sort were small enough so that they could be ignored in making predictions about the long-run effects of changes in money stock.

Though the quantity theory makes the most sense when presented as a theory of explaining total transactions, today it is more commonly discussed as a theory of total spending for production, or of GNP. In part this is because data on GNP are available while those for total transactions are very sketchy, and in part because GNP is a more interesting item to explain than total transactions. There would be no difficulty in making this change if GNP transactions were a constant percentage of total transactions, but they do not seem to be. Not only does the percentage change gradually over long periods, but there are erratic changes over shorter periods. Most proponents of the quantity theory have believed this problem is small enough so that the quantity theory can be used to explain variations in GNP.

The quantity theory can be shown graphically in terms of "aggregate supply" and "aggregate demand." Aggregate demand is the amount of spending people will do, or money multiplied by velocity. If money is 30 and velocity is 7, total spending will be 210. Total spending of 210 can be divided between prices and quantities in a number of ways. If the price level (P) is 1, quantity (Q) will be 210. If P is 2, Q will be 105, if P is 3, Q will be 70, if P is 5, Q will be 42, etc. When graphed with axes of price level and transactions, aggregate demand has the form of a rectangular hyperbola. (A property of this curve is that all

rectangles formed using the origin and a position on the curve as corners and the axis for sides will have the same area.) This curve is shown in Figure 2 as the MV curve.

The quantity theory assumes that transactions are determined outside the model by the availability of resources and by technology. Because it assumes there are no adjustment problems, the aggregate supply curve is a vertical line, which is shown in Figure 2 as the T curve. At each price level the same quantity is available, or price level does not influence quantity. The price level is determined by the intersection of these two curves. If the amount of money increases, the aggregate demand curve shifts to the right. Since transactions are fixed, the end results must be an increase in price level.

Aggregate supply and demand curves provide a simple way to summarize ideas about macroeconomics. To a large extent movements in aggregate demand reflect the sources of economic disturbance which Chapter 7 discussed, and the aggregate supply curve captures problems in adjustment. In later chapters we will see that with different conclusions about sources of economic disturbance or about adjustment, somewhat different aggregate supply and demand curves will emerge.

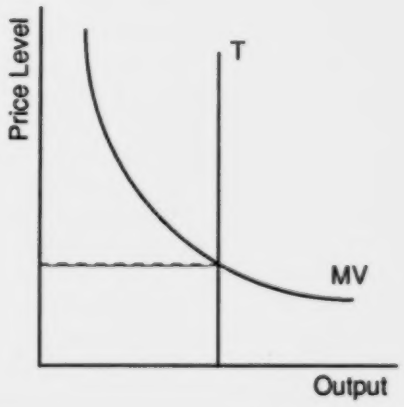


Figure 9.2 Aggregate Supply and Aggregate Demand in the Quantity Theory

COMMODITY MONIES

Money in modern economies is mostly bank debt, and thus the market for money balances can be considered as part of financial markets. However, past societies used **commodity monies**, that is, the thing they used as money was valuable both as a money and for some other purpose. Gold and silver have been popular commodity monies, and cigarettes are another example. With a commodity money, the market for money balances is part of the markets for goods and services.

The quantity theory suggests that a society which uses a commodity money will be subject to disturbances which are different from those which affect a society using bank-debt money. This difference exists because the forces which determine the amount of a commodity money are different from those which determine a credit money. An examination of how a system of commodity money works can be done with supply and demand analysis, and it points out some important predictions of the quantity theory.

A commodity money can give rise to a large amount of price instability if either there are large changes in the supply of the commodity or if there are large changes in the nonmonetary use of the commodity. An example of a commodity money that gave rise to price fluctuations is the cigarette currency used in POW camps in the Second World War. The price of goods in terms of cigarettes depended on the relative availability of cigarettes and goods. If no cigarettes were received in the camp for some time, the supply of them would diminish (because prisoners would use them as commodities: they would smoke them) and their value would rise. A rise in the value of cigarettes meant that cigarettes bought more, or that prices fell. When a shipment of cigarettes would arrive, their increased availability would cause their value to drop, which meant prices would rise. In his description of the system, R.A. Radford

stated that the erratic delivery of cigarettes and the resulting waves of inflation and deflation were a major problem in the mini-economy of the POW camp.[2]

In comparison to cigarettes, gold and silver have been stable monies. There have only been a few times when the amount of these metals changed rapidly. The largest change was probably the influx of gold and silver into Europe after the Spanish looted the Aztecs and Incas.

Perhaps the biggest problems with gold and silver monies have occurred when governments debased them. For example, ancient Rome had a commodity money based on gold and silver. When the emperors in the second and third centuries needed more funds, they often reduced the amount of gold and silver in their coins. As a result, by the end of the third century, Roman coins had virtually no precious metal in them and the Roman empire had serious inflation as the mints churned out worthless coins. However, a monetary reform at the beginning of the fourth century lead to a stable monetary system that lasted almost a thousand years as part of the Byzantine empire.

Commodity monies have some desirable characteristics. The fact that the money also has a commodity use and is produced as a commodity can help dampen the effects of sudden changes. For example, suppose that the amount of a commodity money suddenly doubles. Ignoring the commodity aspect of the money, the quantity theory says that this change should cut the value of the money by one half (which means that the price level should double). When the money is a commodity money, there are three reasons that this prediction may be wrong and that a commodity money will provide more price stability than a money not based on a commodity.

First, the reduced value of the money will encourage people to use the item more in its commodity use. For example, if gold serves as money, and its value drops, people will increase their use of gold for jewelry, tableware, and artistic purposes. Their actions will reflect the law of demand: whenever a commodity becomes cheaper, people use more of it. Thus if there is a sudden influx of gold into a country which uses it as money, part of the influx will be diverted to its commodity use, and the effects on the amount of money, and hence on the price level, will be lessened. On the other hand, a sudden decline will also be cushioned, because as the commodity grows more valuable, people will transfer it from its commodity use into a monetary use. If the amount of gold declines and it rises in value, there is an incentive to melt down jewelry, tableware, and artistic objects and use the gold as money. Hence a doubling of gold may not double the amount of money, and cutting the amount of gold by one half may not cut money by one half.

Second, if money falls in value, the incentive to produce more of it is cut and if it rises in value, the incentive to produce more of it is raised. If the value of gold increases, more people will try to find it, and if its value declines, fewer people will search for it.

A third reason for price stability with a commodity money exists when that commodity is used by many other nations. When the price level in any one nation changes, the commodity will flow across borders to where it is most valuable. In fact, one reason that the quantity theory was initially developed was to explain how the international payments mechanism worked. Prior to the First World War, most countries were usually on what was called the **gold standard**. This meant that gold was the official money, and paper monies were redeemable in gold. In the 18th century some people, now called **mercantilists**, believed that the road to riches for a nation was to accumulate gold. They thought that just as an individual who had more gold was richer than one who had less, so a nation which had more gold in its vaults would be richer than a nation which had less.

A nation received gold from abroad when its exports exceeded its imports. When people bought from abroad—imported—they paid

[2]R.A. Radford, "The Economic Organization of a P.O.W. Camp," *Economica*, XII (Nov., 1945), pp. 189-201.

for the goods with their domestic money. This money would be returned when other nations bought from them. Only if foreigners bought more, or the nation's exports exceeded its imports, would it accumulate an excess of foreign money which could be redeemed for gold. It followed that mercantilists sought to curb imports and spur exports.

The quantity theory, however, suggested that this policy was self-defeating. Suppose a nation was accumulating gold. This gold would be used as money domestically, or it would be used to support paper money. In either case M would rise, and the quantity theory predicted that this would raise the domestic price level. On the other hand, the loss of gold from foreign nations would reduce their money stock, causing prices to drop. The higher prices (relative to prices in foreign nations) in the nation gaining gold would mean that imports would be more attractive because foreign products were now lower-priced. Thus exports would be harder to sell because they would have risen in price relative to foreign substitutes. This change in relative prices would work to stop the gold inflow. This was true even if the nation receiving gold **sterilized** its gold inflows, that is, did not allow additional gold to increase its money stock. Only if nations losing gold also sterilized their outflows could the flow of gold continue so that one nation could acquire the world's gold stock. But before this happened, the gold standard would collapse.

This story is simplistic, and complications in the adjustment process could significantly alter the plot. (For example, goods which are identical regardless of where they are produced, such as grain, must have identical foreign and domestic prices, except for transport costs, or else large profits can be made. This idea is called the "law of one price.") Thornton recognized a few of the complications already in 1802. The story does, however, illustrate the important point that what happens in one nation can have a significant impact in other nations, and that ignoring what happens in other nations may lead one to serious error. Economies are rarely *closed*, independent of what happens outside them.

As the beginning of this section stated, money in modern economies is mostly bank debt. We may think cigarettes, sea shells, or cattle make strange monies, but probably the oddest money ever is bank-debt money.

If you make a bet with a friend about the outcome of a ball game and lose, you have created a debt. This debt is a liability to you because you owe it, and an asset to your friend because it is owed to him. The debt is real to you and your friend, but it has no physical existence. If you did not write out the terms of the debt, it exists only in your mind and in the mind of your friend.

Money in our economy is very similar to this debt which you created with your bet. Much of it has no physical existence other than as accounting entries which specify assets and liabilities. This bank-debt money is not subject to the same restraints that commodity monies have. For example, governments cannot readily alter the amount of a commodity money. They usually can easily alter the amount of bank debt money. How this strange sort of money evolved from commodity monies, and how the government can control the amount of this special form of debt, are subjects of the next chapter.

LIMITATIONS OF THE QUANTITY THEORY

Today almost all economists agree that changes in the amount of money can be an important source of economic disturbance. The consensus among economists is that changes in the amount of money played important roles in German hyperinflation of the 1920s and in the Great Depression of the 1930s. In the Great Inflation there was a tremendous increase in the quantity of money in circulation. There was a sharp drop in the quantity of money at the beginning of the Great Depression. The quantity theory is a simple way to explaining why changes in money can disturb the rest of the economy. However, it is a theory with a number of weaknesses, and it has always had critics

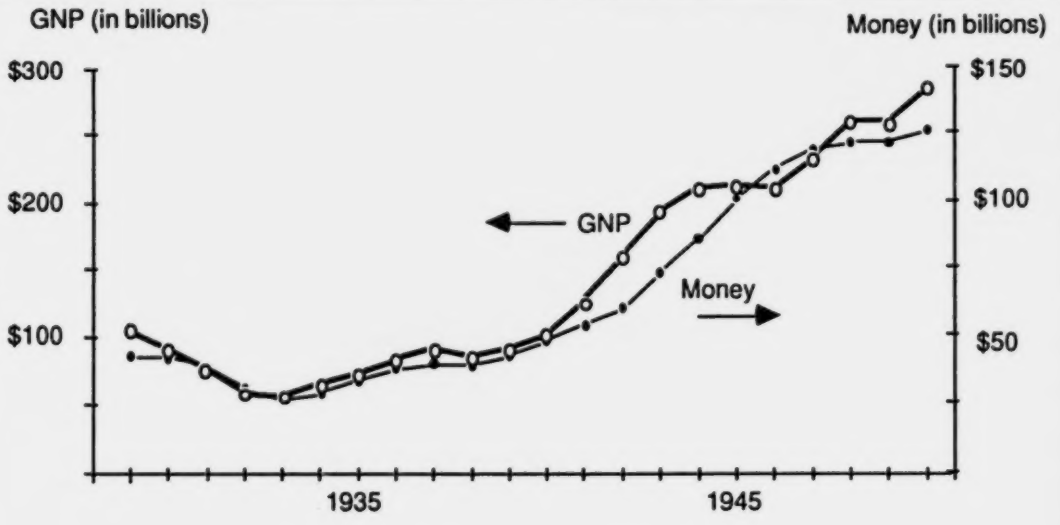


Figure 5.3 Money and GNP in the United States, 1929-1950

Source: U.S. Bureau of the Census, *Historical Statistics of the United States, Colonial Times to 1970*, (Washington D. C., 1975) pp. 224, 992.

who have questioned the assumptions on which it is based.

The most obvious limitation of the quantity theory is that it does not explain recessions or unemployment. It assumes away adjustment problems. Recall that it assumes that production is determined by resources, and since money is not a resource, changes in money should not change production. This assumption seems more appropriate in the 19th century than in the 20th. For example, consider two great deflations in U.S. history, that of 1839-1843 and that of 1929-1933. Both had large declines in the amount of money, 34% in the first and 27% in the second. Both had substantial drops in price level, 42% in the first and 32% in the second. But they were totally different in what happened to real output. In the first case output increased by 15%, while it declined 30% in the second. [3]

[3]These statistics are from Mancur Olson, *The Rise and Decline of Nations* (Yale University Press, 1982), p. 223.

Though there are economists who argue that changes in the amount of money, if they are completely anticipated, should have no effect on output, most economists believe that monetary changes affect both prices and output. Chapter 11 will consider some ways we can add an adjustment process to a quantity theory, and thus make monetary disturbances affect not just prices, but output and unemployment as well.

A second area of controversy about the quantity theory involves the assumption that changes in money are the cause, not the effect. There clearly is a correlation between changes in the amount of money and changes in spending, a correlation that can be found over vast stretches of history and in a great many countries. (See for example Figure 3.) Critics of the quantity theory have suggested that this correlation exists because changes in the amount of money in circulation are caused by, rather than the cause of, changes in business activity. In other words, the critics argue that changes in money are the effect, not the cause.

It is hard to argue the critics' case when a society uses a commodity money. To see why, suppose that inflation has a nonmonetary cause. Inflation decrease the value of the commodity as money. The previous section argued that when the value of a commodity money drops, people should shift the commodity from its monetary use to its commodity use. Thus inflation should decrease the amount of a commodity money. The critics argument suggests that the amount of a commodity money and price level should be inversely related, not directly related as the quantity theory maintains. However, inverse patterns of this sort do not seem to occur.

The critics' argument looks better in a system of bank-debt money. For example, both the amount of money in circulation and spending rise each November and December. It seems unlikely that the change in money causes the change in spending. It is more likely that Christmas causes the increase and spending, and the central bank provides extra money to help that spending take place. However, before we can examine the argument in terms of bank-debt money, we will need to examine more closely how the amount of money expands or contracts, a topic the next chapter begins to explore. We will see in Chapter 11 that even quantity theorists accepted the idea that change in business activity could, in the short run, have a direct effect on money stock.

Finally, the quantity theory assumes that changes in the amount of money in circulation do not alter velocity. The Keynesian Revolution in the 1930s (which Chapter 12 discusses) attacked the assumption that velocity was independent of the level of money stock and dismissed it. Rather a new assumption became standard, that changes in money tended to be offset by changes in velocity. Thus if money increased by 10%, velocity would tend to decline, and as a result the change in income would be less than 10%, and could even be zero.

The reason for the position that money stock and velocity should be negatively correlated involves the interest rate. Assume that money earns no interest, or that it earns interest at a fixed rate. Then an increase in the interest rate paid on nonmonetary assets should make holding idle money balances more expensive. When people hold their assets in the form of money, they forgo the opportunity to earn the interest they could earn if they held assets in the form of bonds. Since people should take into account costs and benefits when determining money balances, they should hold smaller money balances in times of high interest rates.

Further, times of high interest rates should occur when money stock drops. A fall in money stock happens, as we will see in the next chapter, when the amount of bank lending decreases. This implies that fewer funds will be made available to borrowers, or that the supply of lendable funds decreases. This shift in the supply curve should cause the price of loanable funds, the interest rate, to increase. Thus a decrease in bank lending causes both a decrease in money stock and a rise in interest rates, and the rise in interest rates should cause people to reduce idle balances, or increase the velocity of money. The opposite should happen in the case of a rise in the stock of money.

On a theoretical level this criticism is difficult to evaluate. The quantity theory is a long-run theory, and people are in agreement about what it means only as a long-run theory. The quantity theory does not tells us about the short-run effects of a change in money stock, and this is a weakness of the model. The assertion that money stock and velocity were negatively correlated in the short run would not be a serious criticism if the critic did not also suggest that the effects held into the long run. Further, though the logic of the criticism is correct, the critics may be assuming that some variables can be held constant which could reverse the effects if they in fact are not constant. Two such variables are the rate of inflation and expectations of inflation. The amount of cash balances people want to hold should depend on the rate of inflation. When inflation is high, it is expensive to hold assets in the form of cash because money is losing value. Thus if a change in money stock changes either infla-

tion or expectations of inflation, there will be factors changing velocity besides the effects of a shift in the supply curve for loanable funds to the left. Thus the issue is not really a theoretical issue, because one can argue it both ways. It is an issue which only an appeal to real-world evidence can resolve.

The data which the world threw up in the 1940s seemed consistent with this hypothesis that money and velocity are inversely related. During the Second World War the U.S. money stock increased rapidly, but velocity fell. One can also find a negative relationship if one looks at the very short run. (See question 8 at the end of the chapter.) If one looks at what is typical over the past century allowing for some short lags for money to affect spending, there is no clear relationship between cyclical movements in money and velocity.

SUMMARY

In discussing German hyperinflation in Chapter 5, we wondered how such an event could happen. This chapter presents arguments that the source of the disturbance was in the market for money balances, and that we should look for an excessive issue of money. The theme of the quantity theory of money is that inflation is a monetary phenomenon, that it is caused by "too much money chasing too few goods."

This chapter introduced you to the the equation of exchange and the quantity theory of money. It explained the assumptions of the quantity theory, and what the critics of the theory believe. It pointed out that the quantity theory was a long-run theory, and that it became ambiguous in the short run (a problem which Chapter 11 will examine). It also looked at how a monetary system based on a commodity money acts. It did not examine bank-debt money; that is a topic that needs its own chapter.

QUESTIONS

1. Which of the following are stock measurements, and which are flows: the number of students attending class now; the number of meals served in the school cafeteria; the number of apartments built in Cook county in June; the number of tons of steel in the Empire State building; the population of the United States; number of births in Montana in 1987?

2. Should food stamps be counted as part of the money stock? Should thousand dollar bills? Credit limits that people have with credit cards? Explain your reasoning in each case. (Comment: Food stamps are not counted as part of money stock, but banks can consider them as equivalent to currency in meeting the reserve requirements which we will discuss in the next chapter.)

3. In the middle of the 14th century, the Black Death first visited Europe, and in following decades it revisited many times. The plague destroyed about one third of the population, but of course did not destroy land, capital, housing, or money. a) What does the quantity theory of money predict about the changes to output and price level as a result of the plague? (Hint: Use Figure 2.) b) What does the quantity theory predict about gold flows between areas affected and areas untouched? c) (For those who understand the idea of a production function) Do you expect that output fell by more or less than the drop in population? Why?

4. Money can serve as a store of value. If money earns no interest, what happens to its attractiveness as a store of value when interest rates on savings accounts rise? When they fall? When inflation increases? When people decide that interest-bearing assets have grown more risky?

5. Gold has been the commodity most commonly used as money. What characteristics make it a good choice? (Hint: Why are cattle not as good? Why is iron an inferior money? How about blocks of wood, or pints of water?)

6. In a description of the economic life in a prisoner-of-war camp, R.A. Radford said that during heavy air raids in the vicinity of the camp, prisoners would smoke heavily because of nervousness. Given that cigarettes were also used as money, what effect should the heavy air raids have had on the price level in the camp? Explain, using the quantity theory of money.

7. People do not usually hold wealth in the form of milk. Why not? Does the fact that milk is a poor way to hold wealth mean that people hold none of it? Explain. How high would the rate of inflation have to be so that you would prefer to hold wealth in the form of milk rather than money? (Comment: There have been hyperinflations in which milk has been a better store of value than money. Strange things happen with hyperinflation.)

8. Suppose that GNP responds to a change in money with a small lag, and as a result one gets the following relationship between money and spending. From this data calculate the values for velocity, and then look at the relationship between changes in money and changes in velocity. Are these changes positively or negatively related? Does this pattern tend to support, refute, or have nothing to do with the validity of the quantity theory?

PERIOD	MONEY	SPENDING	VELOCITY
1	100	1000	
2	100	1000	
3	102	1000	
4	103	1020	
5	101	1030	
6	102	1010	

9. There are many possible equations on which one can build macroeconomic theories—the equation of exchange is not the only one. Sidney Weintraub has used one of these other equations to build an alternative to the quantity theory of money. (See his *Classical Keynesianism, Monetary Theory, and the Price Level*, (Philadelphia: Chilton Company, 1961), Chapter 3.) Weintraub starts with the identity that total proceeds of businesses equal their wage bill times a constant, which he calls the mark-up. Or in other words, he defines the mark-up as:

$$\text{mark-up} = k = \frac{\text{total revenues}}{\text{total wages}}$$

If a business with revenues of $1 million has a wage bill of $500,000, it has a mark-up of 2.

Total wages can be written as the average wage (w) multiplied by the number of hours worked (N). Total revenues can be written as the product of the amount sold (Q) and the average price (P). Substituting these symbols into the equation above gives:

$$k = (QP)/(wN) = (Q/N)(P/w)$$

The term Q/N is the amount of output divided by the amount of labor, or the output per unit of labor. Another name for this is the productivity of labor (A). Substituting A for Q/N, and then solving the equation for P, gives:

$P = (kw)/A$

In words this says that the price level is equal to the mark-up multiplied by the average wage, divided by the productivity of labor. This statement must be true because mark-up was defined to be whatever value was needed to make it true.

a) If the average wage rises, and other factors are constant, what will happen to price level? If productivity rises and other factors remain constant, what will happen to price level?

b) In order to make the third equation, which Weintraub called the "Wage-Price Mark-Up Equation" into a theory, Weintraub had to make some assumptions. He assumed that k was roughly a constant, arguing that this was reasonable because in the U.S. it had varied little for many years. He assumed that A increased slowly at 2% or 3% a year, so in the short run it too could be treated as a constant. Finally, he argued that w can be considered an exogenous variable, and that causation runs from w to P. What arguments could a critic of Weintraub make to his approach? (Hint: The quantity theory of money can be written as P=MV/T. Look at the arguments against the quantity theory of money and ask what their counterparts would be in this case.) Which of the possible arguments of critics could be settled by examining the data which the real world gives us?

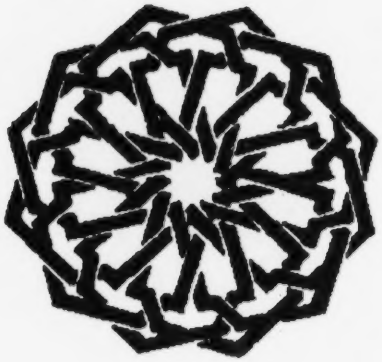
c) The quantity theory suggests that macroeconomic disturbances originate in the market for money balances. Where does the Wage-Price Mark-Up equation suggest many macroeconomic disturbances originate? (Hint: look at Table 4 in Chapter 7.)

10. The data below give data for the average annual rates of money growth, inflation, and real income growth of several countries for the years 1979- 1984. Graph the relations between money growth and inflation, and between money growth and real income growth. Are the results consistent or inconsistent with the quantity theory?

Country	Money Growth	Inflation	Real Income Growth
United States	7.5%	6.5%	1.8%
Belgium	3.0	5.5	1.0
Italy	13.0	19.5	1.8
Japan	4.0	2.2	3.9
Finland	12.1	9.5	3.4
South Africa	30.5	14.9	2.5
Bolivia	220.3	205.9	-2.3
Ecuador	25.2	25.5	2.2
Honduras	9.2	7.1	0.7
Mexico	45.0	52.3	2.7
Peru	67.6	81.1	-0.3
Venezuela	15.3	12.9	-1.7
Cyprus	14.9	10.0	5.5
Bangladesh	18.2	11.4	3.3
Sri Lanka	16.8	18.0	5.1
India	15.6	8.8	5.5
Korea	15.8	10.7	5.8
Malaysia	9.5	4.2	6.9
Nepal	14.3	8.4	2.8

Singapore	9.2	5.3	8.6
Nigeria	14.7	9.8	-2.9

Source: Data taken from *Review*, The Federal Reserve Bank of St. Louis (Vol 70, No. 3 (May/June 1988), p. 15. Their data contained 62 countries. The above table shows every third country when ranked by rate of inflation.



CHAPTER 10

BANKS CREATE MONEY

After you finish this chapter and work the questions at the end, you should be able to:

List the main assets and liabilities of a commercial bank.

Show, using balance sheets, how a check clears; the effects of a bank making a loan; the effects of a bank selling a bond to the public or to another bank.

Define legal reserves.

Distinguish between state and national banks.

Outline the structure and powers of the Federal Reserve System.

Given data on two of deposits, required reserve ratio, and required reserves, compute the missing one.

Given data on required reserves and legal reserves, compute excess reserves.

Using balance sheets, show how the three policy tools of the Federal Reserve can influence the amount of money banks create.

In the last part of the 20th century, commodity monies have almost entirely disappeared. They have been largely replaced by bank-debt money. Paper money throughout the world is usually the debt of a bank which is part of the government. In the United States the Federal Reserve System serves this role. If you look at a dollar bill, you will see which of the twelve Federal Reserve banks issued the bill. Our checking account money is debt of a commercial bank or of some closely related financial institution (such as a savings and loan association or a savings bank).

The story of how our present monetary system evolved from commodity money is an interesting example of actions and decisions which had consequences totally unforeseen by those taking the actions. It is an important story because the quantity theory of money says that changes in the amount of money in circulation are important. One cannot understand how changes in the amount of money come about unless one understands how the banking system creates money.

FROM COMMODITY MONEY TO BANK DEBT MONEY

A commodity money of gold or silver has serious shortcomings. The metals are heavy, storing large amounts in one's home is risky and expensive, and carrying them on long trips is dangerous. If one uses gold or silver in an uncoined form, there is difficulty in determining the quality and there is bother in determining the weight. If gold is coined, practices called shaving and sweating appear. People will file a bit from each coin they obtain before they pass it on for face value, saving the filings (this is shaving), or they will shake coins together in a leather bag, causing tiny flakes of gold to chip off, which they save (this is sweating). In either case, not all gold coins are the same, and some of the advantages of coinage are lost.

In response to these deficiencies, banks evolved in 16th and 17th century England. The occupation that evolved into bankers was usually the goldsmiths. Other merchants needed places to temporarily store large amounts of gold, and they chose to store them with the goldsmiths because the goldsmiths had the best security systems of the day. When merchants stored gold, the goldsmith would give them a statement indicating how much gold the merchant had deposited.

Once merchants began to store gold, paper money developed rapidly. When a merchant wanted to buy something, he could return to the goldsmith and reclaim his gold, or he could sign over the statement he had from the goldsmith to someone else and let that person collect the gold. Because the second option was popular, the goldsmiths innovated and issued statements made out not to a specific person, but to the bearer—whoever presented the statement to the goldsmith could collect the gold. At this point the statement issued by the goldsmith was money by the definition given in the last chapter. It was something that people used to buy things with. The invention of paper money was successful because for some purposes it had more desirable qualities as a money than gold or silver had.

The balance sheet in Table 1 shows the situation that our story has now reached. In Balance Sheet A all of the gold which the goldsmith has in his vault is considered something he owns. It is thus an asset for him. Balancing this gold are the paper money which he has issued to people and his net worth. Remember, the paper he has issued is a promise to pay gold on demand. Thus this newly discovered form of money was quite clearly a liability or debt to the goldsmith. The net worth indicates that he had some gold even before he began to issue the IOUs which began to be used as money. At this point in the story, no additional money has been created. Though the paper the goldsmith has issued is money, the gold he is holding in his vaults should not be counted since it cannot be spent without retiring

TABLE 1 BALANCE SHEET A

ASSETS	LIAB. + NW
100 pounds gold	80 promises to pay gold to depositors 20 net worth

paper.

We are not used to paper money issued by private banks. However, before 1850 all paper money in the United States was issued in this way. Figure 1 shows an example of such a bill. Notice that it says that the bank will pay the bearer five dollars on demand. The bill was not **legal tender**, which means that a person could refuse to accept it in payment of debt. If a person took this bill to the bank which issued it, the bank was legally required to give him legal tender, which before the Civil War was gold or silver coin.

The goldsmiths quickly noticed that since paper was being widely used as money, the gold in their vaults was rarely withdrawn. They saw an opportunity to profit from this situation. They could lend gold and collect a fee, or interest, in the transaction. If the goldsmith lent 30 pounds of gold, his balance sheet would change from that in Table 1 to that in Table 2. As a result of this transaction,

TABLE 2 BALANCE SHEET B

ASSETS	LIAB. + NW
70 pounds gold 30 promises to pay gold to goldsmith	80 promises to pay gold to depositors 20 new worth

the amount of money in circulation increased. The promises to pay depositors, which were circulating as paper money, were still there, but now gold that had previously been in the vault "backing up" the paper was also circulating as money.

Table 3 shows another way that borrowing could take place. Here someone borrowed 30 pounds of gold from the goldsmith, but instead of taking the loan in the form of gold, the person accepted the paper IOUs of the goldsmith. Since people accepted these paper IOUs as money, this transaction also increases the amount of money in circulation. When the goldsmiths began to create money, their careers as bankers began.

Note that it was not the intention of the goldsmith to create money. He simply wanted to rearrange his portfolio. Money creation

TABLE 3 BALANCE SHEET C

ASSETS	LIAB. + NW
100 pounds gold 30 promises to pay gold	110 paper IOUs 20 net worth

was a by-product of the making of the loan. As a result, it is not surprising that many bankers have not understood that they do create money. Some scholars maintain that during the first ten years that the Federal Reserve System was in existence, that is, until the middle of the 1920s, most of the officials of the system, almost all of whom were successful commercial bankers, did not understand that banks create money.

If one focuses on the amount of money, one sees that as a result of the loan, the paper money is no longer 100% backed by gold. Yet from the goldsmith's view, it is still completely backed. It is partially backed by gold in his vault, and partially by other people's promises to pay him in gold.

Figure 10.1 In the 19th century commerical banks issued most of the paper money used in the United States.

Though the bank created money, it was limited by the possibility that holders of the paper would bring in the paper and demand gold. To maintain the ability to pay off the paper money, banks held reserves of gold, and they needed larger amounts of gold as they issued more paper money. There was no fixed ratio of gold to paper money, but rather the ratio depended on the optimism or pessimism of the bankers. When bankers were optimistic, and times were good, they would issue more paper for each pound of gold than when they were pessimistic and worried about redemptions of paper money which they issued.

Though this system of bank-issued money partially backed by gold had many of characteristics of a commodity money, it did not have as much stability. The amount of money could change not only because the amount of gold changed, but also because changes in the optimism or pessimism of bankers changed the amount of paper money in circulation.

CHECKING-ACCOUNT MONEY

Modern banking still creates money, though the process is slightly different. Gold is no longer involved, but has been replaced with paper money issued by the government's bank or with deposits at that government bank. Banks now issue no paper money but only checking-account money. Checking-account money is usually in the form of demand deposits—money the bank must pay to you or for you on your demand. It is also sometimes in the form of NOW accounts, or negotiated order of withdrawal accounts. For our purposes, NOW accounts and demand deposits are identical. The existence of checking-account money, however, makes the story of money creation a bit more difficult to follow than it was in the case of money creation with bank notes. Again, however, the easiest way is to consider a set of banks and their balance sheets. Table 4 presents a simple set.

Bank A has some assets, such as loans and government securities, that earn interest. Both securities and loans are debt owed to the bank. Loans are usually debt contracts which the bank has negotiated directly with the borrower, while securities are debt contracts that the bank buys without negotiating the terms of the contract.

The bank has other assets, such as deposits at the central bank and paper money held in its vaults, which do not earn interest. There is a cost—foregone interest—to holding these non-interest bearing assets. A bank must hold some because it must stand ready to pay depositors who want to exchange deposits for cash. However, modern banks have another reason to hold these assets which earn no interest. Governments, usually acting through their central banks, have laws and regulations which establish the amount of these non-interest bearing assets which a bank must have. We will call these assets **legal reserves**, or bank reserves, or simply reserves.

Bank reserves play a role in the most common banking transaction, the clearing of checks. A check clears in the system when a person writes a check which is deposited in another bank. Suppose Jones, a depositor at Bank A, writes a check for $100 to Smith which Smith deposits in Bank B. When Bank B receives this check, it pays Smith $100 by increasing his checking account. Bank B has now paid for this piece of paper, and in turn wants to be paid. It could send the check on to Bank A and demand payment. Bank A legally must pay, and one way it could pay would be to ship paper money to Bank B. (In practice, banks rarely if ever ship paper money in such transactions.) Bank A would now have paid for this piece of paper, and it in turn wants to be paid. It is paid when it subtracts $100 from Jones' checking account. Table 5 shows the end result of the story. Bank A has lost deposits and reserves and Bank B has gained them.

Paying by check sets into motion a chain of transactions. Though Table 5 shows the logic of how a check clears, the chain is

TABLE 4 BANK BALANCE SHEETS

Central Bank

Assets	Liabilities + NW
government securities gold	paper money deposits of Bank A deposits of Bank B

Bank A		*Bank B*		*Public*	
Assets	Liab. + NW	Assets	Liab + NW	Assets	Liab + NW
loans govern. sec. dep. at central bank paper money	checking accts. savings accts. other	loans govern. sec. dep. at central bank paper money	checking accts. savings accts. other	deposits at banks paper money govern. sec.	loans from banks net worth

usually more complex than in this story. Bank B could have sent the check to Central Bank for payment. Central Bank would have paid Bank B by increasing the deposits Bank B has at Central Bank, and then sent the check on to Bank A with a note saying that its deposits at Central Bank had been reduced by $100. In this case, Bank A would have lost not paper money but deposits at Central Bank and Bank B would have gained them.

Once you understand how a check clears, you are ready to understand how banks can create, or destroy, money. Suppose Bank A decides that it has $100 more of reserves than it wants. This means that it would prefer to hold an interest-bearing asset rather than non-interest bearing reserves. To obtain such an asset, it can write a check on itself and buy government securities (debt of the government that earns interest) from the public. The public now has a reduction in its security holdings and a check for $100 from Bank A. Suppose this check is deposited in Bank B. The check will clear as any check, and the end result will be the changes in Table 6.

TABLE 5 THE LOGIC OF CHECK CLEARING

BANK A		BANK B	
Assets	Liab. + NW	Assets	Liab. + NW
-100 paper money	-100 Smith's checking account	+100 paper money	+ 100 Jones' checking account

Notice that the public now has $100 more in checking accounts than it previously had. Money has been created. This creation of money is not readily apparent to anyone in the banking system. Bank A did not intend to create more money—it merely wanted to exchange non-interest bearing assets for assets that earn interest. Bank B receives the new money, but this new money looks to it just the same as the "old" money that it received when Jones wrote a check to Smith. The creation of money, an aspect of the banking system that economists consider central, is to the banking system a side effect, or a by-product of its activity in trying to make a profit.

Banks also create money when they lend money to borrowers and they destroy money when loans are repaid. (Question 4 at the end of the chapter challenges you to explain this process.) But banks cannot create money in unlimited amounts. Their ability to create money is limited by the amount of legal reserves they have and by regulations which tell them how much reserves they must hold. Banks cannot create or destroy these reserves, but the central bank can. Hence it is the central bank which ultimately determines how much money circulates in an economy.

THE FEDERAL RESERVE AND MONETARY POLICY

The Federal Reserve regulates banks by requiring them to hold a certain amount of their assets in a form that does not earn interest. Prior to the Depository Institutions Deregulation and Monetary Control Act (DIDMCA) passed in 1980, only banks which were members of the Federal Reserve system had to obey these regulations. National banks, banks which had received their charter from the Comptroller of the Currency which is part of the U.S. Treasury Department, had to belong to the system. But state banks, which had gotten their charters from state banking authorities, did not have to belong, and most did not. Because the regulations to hold assets which do not earn interest were costly for most banks, most new banks during the 1960s and 1970s were chartered as state

TABLE 6
CLEARING A CHECK THROUGH THE CENTRAL BANK

Central Bank

Assets	Liab. + NW
	dep. of Bank A -100 dep. of Bank B +100

Bank A

Assets	Liab. + NW
dep. at Central Bank -100 gov. sec. +100	

Bank B

Assets	Liab. + NW
dep at Central Bank +100	dep of Public +100

Public

Assets	Liab + NW
gov. sec. -100 dep. at Bank B +100	

banks, and the percentage of deposits held in member banks declined during this period. This decline worried government policy makers, and was a major reason for the change in regulations in DIDMCA. Now all financial institutions which issue deposits against which checks can be written are subject to the same reserve requirements.

In the last section we saw that banks created money as a by-product of their quest for profit. Banks are limited in the process of money creation by the need to hold some assets in the form of reserves. In the early days of banking, banks needed reserves so that they could redeem deposits or notes on demand. Today the amount of reserves and the form which they take are determined by government regulation. In the United States only vault cash or deposits held at a Federal Reserve Bank can serve as reserves. The amount of reserves which banks must hold is calculated as a percentage of the deposits they hold. This percentage is called the required reserve ratio. In equation form, required reserves are computed as:

(1) Required Reserves = (Required Reserve Ratio)x(Deposits).

(See Question 13 for complications on this simple formula.)

Banks can hold more reserves than are required. Any reserves above what are required are excess reserves, or:

(2) Excess Reserves = Legal Reserves - Required Reserves.

Banks prefer not to hold excess reserves because in doing so they sacrifice the opportunity to hold other assets which earn interest and because today there are no benefits in holding excess reserves. Since 1960 the amount of excess reserves held in the banking system has been only a small fraction of total reserves.

If excess reserves can be ignored, then any change in either reserves or in the required reserve ratio will change the amount of deposits people hold, and thus the amount of money in circulation. Banks by themselves can change neither. Though the public can cause changes in both, most changes in them are the result of the Federal Reserve System using its three policy tools.

The first policy tool, which is rarely used, is the ability to change the **required reserve ratio**. If the Federal Reserve increases this ratio, the banking system is forced to destroy money, and if the Federal Reserve decreases this ratio, the system is encouraged to create money.

The second policy tool, which is used a bit more than the first, is the **discount rate**. One way a bank can obtain reserves is by borrowing them from the Federal Reserve. When the Federal Reserve charges a high interest rate for these borrowings, banks will not borrow as much reserves as when the Federal Reserve charges a low interest rate.

The third and most commonly used policy tool is **open-market operations**. In open-market operations the Federal Reserve buys or sells U.S. government securities, usually T-bills, in the secondary market mentioned in Chapter 8. (These transactions are totally distinct from sales of Treasury securities in which the Federal Reserve acts as an agent of the Treasury in marketing its debt. Such sales are into the primary market.) When the Federal Reserve buys securities, it pays with a check drawn on itself, and this check, when a commercial bank submits it for payment, gives rise to bank reserves. Thus the Federal Reserve creates the funds with which it buys T-bills. The process by which the Federal Reserve creates bank reserves is remarkably similar to the process by which banks create money. A major difference is that the creation of bank reserve is not a by-product of a quest for profit. On the contrary, any profit is the by-product of an attempt to maintain some level of reserves. Indeed, if a modern central bank set out to maximize profit, it is doubtful that the monetary system could long survive.

Decisions about how these three tools will be used are reached by twelve people serving on the Federal Open Market Committee (the FOMC). The FOMC meets each month and determines what the monetary policy of the United States will be. This control over monetary policy means that the twelve people

who serve on this committee are among the most powerful people in Washington. Seven of these twelve make up the Board of Governors of the Federal Reserve System. The governors are appointed by the President and confirmed by the Senate for 14 year terms. The other five are presidents of the Reserve banks. The president of the Federal Reserve Bank of New York always serves on the FOMC, and the other four positions rotate as one year terms among the other eleven presidents.

MONETARY POLICY AND BALANCE SHEETS

Many students find the process of money creation difficult to understand. Much of the difficulty comes from the existence of checking-account money which has the ability to flow through the system, disappearing from one bank and reappearing at another. If the only money in the economy were paper issued by the government, one could more easily understand money creation. In such a system money would be created when the government printed more to pay its bills. If money did not need to be redeemable in terms of precious metal, there would be no limits to the amount of money which the government could print. Alternatively, the government could destroy money by collecting it through taxes and burning it.

Though the underlying principles are not much different in our modern monetary system, they are complicated by the money which banks issue. For some students the role of the government in money creation and destruction is easier to comprehend if it is illustrated with the aid of bank balance sheets. A set of bank balance sheets for an economy with only two banks is given in Table 7.

If the required reserve ratio is 10%, both banks exactly meet the reserve requirement. In Bank A, 10% of $50 million is $5 million, and in Bank B, 10% of $100 million is $10 million. Now suppose that John Smith who banks in Bank B gives a check for $1 million

TABLE 7 BANK BALANCE SHEETS
(amounts in millions of dollars)

Bank A

Assets	L+NW
reserves 5	deposits 50
securities 30	other 5
loans 15	
other 5	

Bank B

Assets	L+NW
reserves 10	deposits 100
securities 40	other 10
loans 50	
other 10	

Central Bank

Assets	L+NW
securities 20	dep. of A 5
other 5	dep. of B 10
	other 10

Public

Assets	L +NW
securities 200	other 350
dep. at banks 150	
other 100	

to Joe Doe who deposits it in his account at Bank A. Bank A pays for the check by increasing Doe's deposits by $1 million. It then sends the check to the Central Bank for payment. The Central Bank pays by increasing the deposits of Bank A (which are part of A's reserves) by $1 million, and in turn wants payment from Bank B. It obtains payment by subtracting $1 million from the deposits of Bank B (which are part of B's reserves), and sends the check on to Bank B. Bank B receives payment for the check by subtracting $1 million from John Smith's deposits.

As a result of this transaction, Bank A has deposits of $51 million and reserves of $6 million. It needs reserves of 10% of $51 million, or $5.1 million, so it has excess reserves of $.9 million. Bank B has deposits of $99 million and reserves of $9 million. It has a reserve deficiency of $.9 million because it should have $9.9 million.

Bank B can make up its reserve deficiency in a number of ways. It can simply borrow the excess reserves of Bank A. Or it can sell $.9 million of interest-earning assets to Bank A in return for $.9 million in reserves. Or it can reduce its loan portfolio by refusing to make new loans until enough old loans have been repaid so that it no longer has a reserve deficiency. If it takes this option, it will destroy money. However, if Bank A is making extra loans because it now has excess reserves, there need be no change at all in the total bank loans outstanding as a result of the shift in deposits.

There is a very different outcome when the Central Bank *sells* $1 million in government securities from its portfolio. Suppose Joe Doe buys them, paying for them with a check drawn on Bank A. The Central Bank will want to be paid for this check, and will collect by subtracting $1 million from the deposits which Bank A has with it. The check will then be sent back to Bank A, which will collect on the check by subtracting $1 million from the account of Joe Doe. Starting from Table 7, the sale of $1 million in securities by the Central Bank yields Table 8.

The public still has the same amount of assets, but it has less money and more securities than it had previously. Bank B is unaffected by these changes and still meets

TABLE 8 BALANCE SHEETS AFTER SALE BY CENTRAL BANK
(amounts in millions of dollars)

Bank A

Assets	L+NW
reserves 4	deposits 49
securities 30	other 5
loans 15	
other 5	

Bank B

Assets	L+NW
reserves 10	deposits 100
securities 40	other 10
loans 50	
other 10	

Central Bank

Assets	L+NW
securities 19	dep. of A 4
other 5	dep. of B 10
	other 10

Public

Assets	L +NW
securities 201	other 350
dep. at banks 149	
other 100	

its reserve requirements. Bank A, however, needs $4.9 million in reserves but only has $4 million. It must try to find more reserves. It cannot borrow them from Bank B, so it may try to get reserves by changing the composition of its assets. It can do this by selling $.9 million of securities to the public.

Suppose the $.9 million of securities are bought by John Smith who banks at Bank B. He pays for them by writing a check. After the check has cleared, Bank A will have gained $.9 million in reserves and lost $.9 in interest-earning assets. The bankers at Bank A see no changes at all in the money stock as a result of this transaction. However, at Bank B there was a reduction of both deposits (and hence money held by the public) and of reserves. Bank B now has reserves of $9.1 million and deposits of $99.1 million. It has a reserve deficiency of $.81 million. Bank A got rid of its reserve deficiency only by passing it on (though in a slightly smaller form) to Bank B.

As a result of the sale of $1 million in securities by the Central Bank, total bank reserves are now $14 million. With this level of bank reserves, the banking system can only support $140 million in deposits. Bank A and Bank B will each try to shift funds into legal reserves from interest-earning assets. But the amount of reserves is fixed; whatever one gains, the other loses. The attempts by the banks to rearrange their portfolios would be met with perpetual frustration if it were not for something both banks may be unaware of: their attempts to shift their assets from a form which earns interest into a form which does not will gradually reduce deposits and thus the need for reserves.

Open-market operations are used both when the Federal Reserve wants to change bank reserves and when it wants to *prevent* a variety of factors which it does not control from changing them. When open-market operations are intended to keep bank reserves from changing, they are **defensive.** The balance sheet of the Federal Reserve has a number of items (most of which can be left for you to explore in more advanced courses). The logic of balance sheets says that any change in one account must cause a change in another. In practice, most changes in the Federal Reserve's balance sheet cause changes in deposits of banks, or bank reserves.

Consider, for example, changes in Treasury balances. When the Internal Revenue Service (IRS) collects taxes, it deposits the receipts into accounts at commercial banks. There is a shift in deposits in the commercial banks from individuals and businesses to the government, but the total amount of deposits and of bank reserves is unchanged. The Treasury then transfers these funds to accounts at the Reserve banks from which the U.S. government pays its bills. When these funds are transferred to the Federal Reserve banks, banks lose both deposits and bank reserves. When the government spends these funds, the deposits shift back to the banks, and pull reserves along with them. Since there is considerable variability in this process and in the Treasury's account at the Reserve banks, the Federal Reserve usually offsets the effects of these transactions with open-market operations.

What limits the amount of money in circulation in this system of bank debt? Nothing but the good sense of the people who control the central bank. There is no limit to the amount of money that can be created with this sort of system—German hyperinflation is an example. The German hyperinflation could not have happened if Germany had based its monetary system on a commodity.

SUMMARY

This chapter introduced you to one of the mysteries of macroeconomics, that banks create the money of modern economic systems. The idea of banks creating money sounds strange to someone who thinks of money as gold or silver. However, for several centuries now most money has been in the form of bank debt. A checking account is nothing more than money which the bank owes you, and paper money represents something that the Federal Reserve System

owes you. (Try to collect this debt from the Federal Reserve, though, and see what you get.) When one sees the creation and destruction of money as the creation and destruction of bank debt, the process is less mysterious.

This chapter explained how bank-debt money evolved from commodity money and how transactions in the banking system could be followed using balance sheets. It explained how checks clear through the system, and how in the process of trying to maximize the return on their assets, banks create money. Thus, money creation is a side-effect of banking. Finally, the chapter looked at how central banks control the system of money creation in modern economies.

QUESTIONS

1. Jane Doe finds that she needs more cash. She goes to her bank and withdraws $500 from her savings account. As a result she now has $500 more in currency and $500 less in her savings account. Show the changes this transaction has on her bank's balance sheet:

Jane's Bank

Assets	Liabilities
Vault Cash ____	Checking Accounts ____
Deposits at the	Savings Accounts ____
Fed. Res. ____	Other Liabilities ____
Loans ____	Net Worth ____
Securities ____	
Other ____	

2. What happened to the legal reserves in the banking system as a result of Miss Doe's withdrawal in question 1?

3. Suppose that the bank below finds that it needs $50,000 more vault cash. How will it obtain it, and what changes will occur on its balance sheet? (Hint: How would Jane get cash if she withdrew it from her checking account in question 1? The bank gets it in a similar way.)

New Bank

Assets	Liabilities
Vault Cash ____	Checking Accounts ____
Deposits at the	Savings Accounts ____
Fed. Res. ____	Other Liabilities ____
Loans ____	Net Worth ____
Securities ____	
Other ____	

4. Suppose John Smith has $1000 in his checking account at the New Bank. He also owes the same bank $500 for a student loan. He writes a check for $500 to pay off the loan. (a) What changes will this transaction cause on the bank's balance sheet?

b) What, if anything, will happen to the amount of money in the economy as a result of this transaction?

c) What, if anything, will happen to the amount of legal reserves in the banking system?

d) Now suppose that Bruce Brown borrows $200 from the bank. Which items on the balance sheet will change? (Comment: There are two ways this question can be answered.)

e) As a result of the loan to Bruce Brown, what will happen to the amount of legal reserves which the bank has? What will happen to the amount of money in circulation?

New Bank

Assets	Liabilities
Vault Cash ____	Checking Accounts ____
Deposits at the	Savings Accounts ____
Fed. Res. ____	Other Liabilities ____
Loans ____	Net Worth ____
Securities ____	
Other ____	

5. Jane Doe writes a check for $49.98 to Richard's Pharmacy. Jane banks at Jane's Bank, and Richard's Pharmacy at the New Bank. Richard's Pharmacy deposits the check in its checking account, and the check clears through the system.

(a) Write the changes which this transaction will cause on the balance sheets below.

b) What, if anything, will happen to the amount of money?

c) What, if anything, will happen to the amount of legal reserves?

Jane's Bank

Assets	Liabilities
Vault Cash ____	Checking Accounts ____
Deposits at the	Savings Accounts ____
Fed. Res. ____	Other Liabilities ____
Loans ____	Net Worth ____
Securities ____	
Other ____	

New Bank

Assets	Liabilities
Vault Cash ____	Checking Accounts ____
Deposits at the	Savings Accounts ____
Fed. Res. ____	Other Liabilities ____
Loans ____	Net Worth ____
Securities ____	
Other ____	

6. Show what happens in Table 3 in the chapter if someone returns 10 worth of paper money to the bank and demands gold. What will the numbers in the new balance sheet be?

7. Suppose the banking system has $20 billion in total reserves with no excess reserves. If the legal reserve ratio is 20%, the total amount of demand deposits supported by these reserves can be $_____.

If the Federal Reserve lowers the legal reserve ratio to 10%, the money supply can _____ by $_____.

8. Start with these balance sheets (amounts in billions of $s):

FEDERAL RESERVE

Assets	Liab.
U.S. Gover. Sec. 50 Other 20	Dep. of Banks 18 F.R. Notes 40 Other 12

BANK A

Assets	Liab.
Legal res. .1 Loans 1	dem. dep. 1 Other .1

a) If the legal reserve ratio is 10%, does Bank A have any excess reserves?

b) Suppose the Federal Reserve buys $.1 billion of U.S. securities. It pays by writing a check on itself. The seller of the securities deposits this check in his account at Bank A. The depositor will be paid by having his checking account _____ by $_____.

c) Bank A forwards the check to the Federal Reserve for payment. The Federal Reserve will pay Bank A by _____.

d) As a result of the transactions in parts b and c, what will the balance sheets of the Federal Reserve and Bank A look like?

e) As the immediate result of this transaction, the money stock has _____ by $_____.

f) Bank A now has excess reserves of $_____.

g) If Bank A wants to eliminate these excess reserves, it can buy securities or make a loan for $_____.

h) The extra reserves created by the Federal Reserve's action can support an extra $_____ in new checking-account money.

9. What will happen in the balance sheet of the previous question if the Federal Reserve sells $150 million of securities and Bank A buys them?

FEDERAL RESERVE

Assets	Liab.
U.S. Govern. Sec. Other	Dep. of Banks F.R. Notes Other

BANK A

Assets	Liab.
Legal Res. Loans	dem. dep. Other

10. Start with these balance sheets:

Federal Reserve

Assets	Liab. + NW
borrowings by banks $1	dep. of banks $18
U.S. secur. $50	all other 52
other 19	

(in billions of $s)

Bank D

Assets	Liab. + NW
reserves $15	dem. dep. $100
loans $95	other $10

(in millions of $s)

a) Suppose Bank D borrows $1 million from the Federal Reserve to increase its reserves. Which items on the balance sheets above will change?

b) If the legal reserve ratio is 15%, the extra reserves will allow the banking system to expand the money stock by a maximum of $_____.

11. If an individual bank is short of reserves, it can increase its reserves by selling short-term securities. In the balance sheets below, Bank A is selling $1000 in securities. (a) Complete the balance sheets, showing the effects of this transaction. (Assume that the public buys the securities and pays by writing a check on one of the "All other banks.")

Bank A

A	L
-$1000 securities	

All other banks

A	L

Public

A	L

b) Complete them assuming that one of the other banks buys the securities.

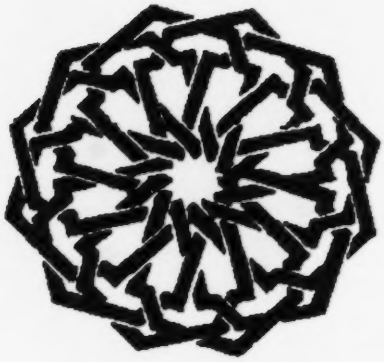
c) Does this action of Bank A increase the total of bank reserves held in the banking system?

12. "The Federal Reserve can increase the supply of money by selling securities. These securities are taken to the commercial banks where they are deposited as reserves. Now commercial banks can lend out more money, because when borrowers come in, they (the borrowers) will exchange an IOU (loan) for money in their checking account. An amount several times the additional reserves can be loaned out by banks, and hence we have an increase in money stock resulting from open-market operations."

Where are the errors in this explanation? Rewrite it so that it is correct.

13. In late 1983 the reserve requirements which the Federal Reserve established were that for the first $28.9 million of deposits in transactions accounts, financial institutions had to hold a 3% reserve requirement, and they had a 12% reserve requirement on checking account deposits above $28.9 million. Suppose a bank had $40 million in checking accounts. How much would it have to hold in reserves?

14. Who are the current members of the FOMC? (Hint: their names appear in each month's issue of the Federal Reserve Bulletin which most libraries have.)



CHAPTER 11

BUSINESS CYCLE THEORIES

After you finish this chapter and work the questions at the end, you should be able to:

Explain the business-cycle framework.

Explain the accelerator principle.

Give an example of a feedback relationship.

Explain how investment and money stock could interact to create a business cycle in the 19th century banking system.

Chapter 7 explained that the various sectors of the economy are interrelated. Hence disturbances in one part of the economy can result in symptoms of that disturbance in another part that is far removed. The last three chapters have searched for disturbances in financial and money markets. They showed that many economists believe that largedisturbances have originated in the supply and demand for money balances. Chapter 9 explained the quantity theory of money, a major theory of macroeconomics, but noted that this theory was limited because it did not explain what should happen in the adjustment process.

This chapter adds the short-run story which many economists who believed the quantity theory of money told (and tell). By discussing adjustment problems, it fills in the gap left in Chapter 9. This chapter also gets you ready to look at a new story which other economists tell. These economists believe that many economic disturbances originate not in the supply and demand for money, but in goods markets. Hence a second function of this chapter is to build a bridge from the previous chapters to the next chapters.

THE IDEA OF A BUSINESS CYCLE

Economic "crises" occurred throughout the 19th century. By the latter part of the century, a number of observers had come to the conclusion that there was a regular, wavelike pattern to crises, and they called this pattern the **business cycle**. A cycle, which means fluctuations are regular and periodic, needed an explanation. What caused the pattern? What forces determined the length and amplitude of the waves? Could the cycle be eliminated?

Research on business cycles expanded rapidly early in the twentieth century, but receded after the 1930s. Though the peak in study of the cycle has passed, many of the ideas developed during the boom years of business-cycle research remain as major ideas in macroeconomics.

Though a large number of people once believed that a business cycle existed, they agreed on little else. The literature is notable for the wide variety of contradictory ideas it harbors and for the lack of commonly accepted terms to describe basic ideas. Also, many writers were ambiguous and unclear in what they wrote, and there is sometimes a tendency to read more into what they wrote than they may have meant. Two very good summaries of the literature are Gottfried Haberler's *Prosperity and Depression* (Geneva: League of Nations, 1941) and Robert A. Gordon's *Business Fluctuations* (New York: Harper, 1952). They form an interesting contrast because they group theories differently and differ considerably on what they believe were valuable contributions in the literature and what they think was nonsense.

Figure 1 illustrates a framework in which business cycle theories were often constructed. Starting at point A, the economy grew very rapidly in a self-feeding growth. Because of this "self-feeding" process, the economy would develop momentum. Once started upward, it would continue upward. Growth would continue until the system hit a limit or boundary which would stop it. The economy would then turn around and enter a contraction which was also self-feeding. This downswing would continue until a lower boundary was encountered, which would stop the contraction and start a new upswing. Notice that in this view the economy is never in equilibrium. It is perpetually adjusting, never reaching and maintaining an equilibrium.

Though many business-cycle theorists accepted this basic picture, they differed on what provided the upper and lower bounds and why the self-feeding process would take place. Sometimes their differences were matters of emphasis. What one took as part of the institutional structure or as a "given," another would emphasize as the central causal force. To use an analogy, suppose two people are trying to explain why a windmill is turning. One argues that it is the wind which

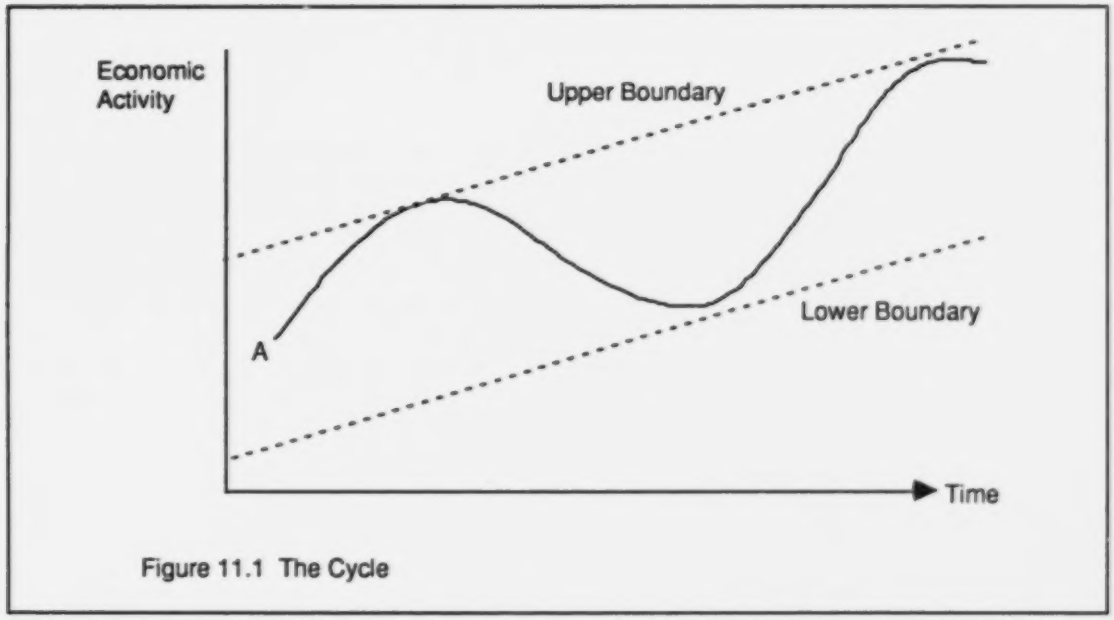


Figure 11.1 The Cycle

causes everything and the other argues that the rotation depends entirely on the pitch of the blades. This disagreement would be more apparent than real. They differ in what factors should be taken as given and which to consider as causal. One person takes the wind as given and then examines the structure of the machine, while the other accepts the machine as given and looks instead at outside forces.

In the business-cycle framework of Figure 1, lines of causation are difficult to test because of *feedback*. To see this, consider a simple cycle, the temperature in a house heated by hot-water radiators. When it is cold outside, the rooms lose heat. Eventually the house reaches a temperature so that the thermostat lights the boiler and starts water circulating to the radiators. This does not immediately stop the decline in temperature because it takes time for the heat to be transferred from the fire to the water to the radiator to the air near the thermostat. Nor does the furnace shut off once the decline has stopped. Rather it continues to heat water until the temperature of the air at the thermostat has reached a shut-off level. After the furnace has shut off, the temperature in the house will continue to rise for a while because at the time of shut off the water in the radiators had been heated to its highest value.

It is clear that the behavior of the furnace determines the temperature in the house. It is equally clear that the temperature in the house determines the behavior of the furnace. This is because the system involves feedback. Variable A determines variable B, but in turn variable B determines variable A. Systems of this type can be difficult to explain if only the facts are available and a good theory is not available to explain the facts. For example, suppose someone who had no idea of how heating systems worked was given a chart of temperatures in the house and the times when the furnace was on. Perhaps the most obvious relationship in these data would be that when the house was coldest, the furnace was on. A person with no knowledge of the system might conclude that the furnace made the house cold, and turning it off heated the house. Unless one knows what to look for, or when one looks for the wrong things, strange conclusions can emerge from studies of complex systems.

Not all economists working in the late

19th and early 20th centuries accepted the business-cycle framework, and some business cycle theories do not fit it. Irving Fisher is an example of an economist who had a theory of business fluctuations, but had serious reservations about *cycles*. Though he agreed with many of the ideas mentioned above, he stressed the differences of each episode, and did not believe a regular, periodic cycle existed. Other economists, such as Joseph Schumpeter, had much more elaborate frameworks. Schumpeter thought there were three cycles within the economy: a long, 60-year cycle, a moderately long, 10-year cycle, and a short, 40-month cycle.

The best examples of theories of business cycles which do not fit the above framework are theories relying on sunspots or other astronomical phenomena. Several prominent economists developed these theories in the 19th and early 20th centuries. According to sunspot theories, changes in sunspots caused changes in harvests, which in turn affected the overall performance of the economy. Perhaps the weirdest of these theories was that of Henry L. Moore, an American economist who was an early user of mathematics. Moore, after considerable statistical work, concluded that there was an eight year cycle and attributed it to the planet Venus which every eight years passes directly between the earth and the sun. None of these theories involved feedback, and they did not have self-feeding processes which some boundary stopped. All have predicted so poorly that today they are as dead as economic ideas ever get.

FINANCING A BUSINESS CYCLE

A theory which fits into the structure of the previous section is a theory which emphasizes business optimism and pessimism. Suppose for some reason businessmen become more optimistic, and as a result begin to increase inventories and build new factories. Their optimism could be self-fulfilling, for as output expands, income and consumption will also increase. If in turn the extra spending leads to even more optimism, a self-feeding process of growth would take place. But sales cannot continue to increase indefinitely because of supply limitations (the economist's concept of the production-possibilities curve). When full capacity is reached, growth slows and stops, and businessmen realize that they have become too optimistic. They then revise downward their expectations and become pessimistic. This can also lead to a self-feeding process, this time downward. Production is cut, and thus employment and income. Consumers buy less, and business gets even more pessimistic. The contraction eventually stops when businessmen realize that they have become too pessimistic, which turns the process around again.

No business cycle theory was ever built solely on waves of optimism and pessimism, but many considered such waves as part of the explanation of the cycle. Two items are noteworthy in this explanation. First, it assumes that financing needed to purchase the goods could expand and contract as needed, and second, there is an emphasis on the importance of investment spending. If an economist focused instead on the expansion and contraction of financing, or on the fluctuations in investment, he could very well build in waves of optimism and pessimism as part of the structure of things that should be taken as given. In fact most business cycle theories that fit the business-cycle model of the last section emphasize either monetary factors or investment.

An example of a monetary theory of the business cycle is that of R.G. Hawtrey, an English economist of the early 20th century. Hawtrey's theory was a dynamic variant of the quantity theory of money. His theory centered on fluctuations in bank credit and demand deposits, and to understand it, you must recall the process by which banks create money.

Hawtrey began with an economy which was initially at rest. For some reason the interest rate dropped. The drop in interest

rate would cause merchants to demand more bank credit, and in the process of granting loans to the merchants, banks would create money. The increase in orders by business increases income and hence would generate more spending. Further, said Hawtrey, not only would money increase, but velocity would as well. People would tend to spend their money faster in good times than they do in bad times. The process is cumulative or self-feeding because the increase in money increases total spending which gives merchants a further inducement to borrow.

The upswing would be stopped by bank reserves, either gold in a country with a gold standard or by central-bank authority in other cases. Hawtrey's argument here makes more sense in situations in which there are no reserve requirements established with the force of law. In these situations each bank must decide for itself whether it has sufficient reserves to meet unexpected withdrawals. When such systems were in force, actual reserve ratios showed considerable fluctuation. In Hawtrey's upswing reserves were constant, and as more and more money was created, the ratio of reserves to money fell. Eventually it would reach a level at which banks began to feel uncomfortable, and they would then stop increasing loans. The stoppage of money growth halted the upswing, and could turn it around into a self-feeding decline. The lower turning point would be reached when banks felt that their reserve-to-deposit ratio were too low and cut interest rates to spur borrowing.

Hawtrey did not believe that the cycle would necessarily be periodic, that is, with a constant length of time from peak to peak. The many accidental and unpredictable forces affecting the economy could shorten or lengthen any particular upswing or downswing. Thus Hawtrey deviated a bit from the framework we described in the previous section (but most other business-cycle writers did too).

Hawtrey also considered the possibility that an economy could break through the lower boundary and become trapped with what he called a "credit deadlock." If business activity became too depressed, even very low interest rates might not get merchants to borrow more, and thus there would be no turn-around. In exploring this possibility, Hawtrey echoed Thornton who in 1802 warned against severe reductions of the stock of paper money to prevent an outflow of gold. Thornton believed that too severe a reduction would destroy the forces which correct the problem of the gold outflow. Hawtrey foreshadowed the *liquidity trap* of John Maynard Keynes which also describes conditions in which the economy could become severely depressed without recuperative powers.

Notice that Hawtrey's cycle violated all three assumptions of the long-run quantity theory of money. Other writers, such as Irving Fisher, who proposed monetary theories of business fluctuations, also violate all three assumptions. First, Hawtrey allowed velocity to change, rising when business activity is high and falling when it is low. The effect of this pattern is to magnify changes in money—a 10% change in money stock will have more than a 10% change in total spending. Note that this is not inconsistent with the quantity theory of money if the quantity theory is seen only as a long-run, equilibrium proposition. A discussion of business cycles is a discussion of what happens in the short run, when adjustment is taking place.

Second, though changes in money stock affect total spending, there is feedback so that a change in total spending also affects money. Again, this need not contradict the quantity theory if the quantity theory is seen as a long-run theory because feedback only takes place in the short run. However, the feedback mechanism which Hawtrey described is unlikely to be of great importance today in most countries. Today central banks proscribe minimum reserve requirements. They are not left to the discretion of commercial banks. Further the existence of central banks is meant to eliminate a major monetary problem of the 19th century, the bank run. Central banks imply that the government guarantees the money, whether or not it creates it. Hence the amount of reserves a bank would choose to hold today is usually

less than the bank is required to hold. This last item would explain why variations in the reserve ratio are of negligible importance today in explaining fluctuations in the stock of money. Hawtrey's theory may have had merit at one time, but Hawtrey himself believed that once Western countries abandoned the gold standard in 1914, a mechanism that gave the cycle regularity was destroyed. Certainly his theory no longer explains the interactions between money stock and economic activity.

Third, changes in money affect not just prices, but output. Only in the long run is money "neutral," without effects on output.

INVESTMENT AND SAVINGS IN BUSINESS CYCLES

A problem that some economists saw in a purely monetary theory was that it did not explain why most of the changes in production over the cycle were in the form of investment. Consumption spending was quite constant over the cycle, while investment spending showed large increases and decreases. Two very different sorts of ideas arose in an attempt to explain why investment showed such large swings. Gottfried Haberler groups one set of ideas together under the banner of "overinvestment" theories. The other set of theories is commonly referred to as "underconsumptionist" theories.

The overinvestment theories formed the largest group of business-cycle theories. All of them assumed that the stock of money would swing with movements in investment because increased spending must be financed. Some of the overinvestment theories put considerable stress on monetary factors and Haberler grouped them together as theories of "monetary overinvestment." Others kept the monetary factors in the background, and Haberler grouped them together as theories of "nonmonetary overinvestment." Uniting all, however, is the idea that disturbances in the economy are not purely of monetary origin. The market for goods and services also contributes to macroeconomic disturbances.

Overinvestment theories were based on the ideas of Knut Wicksell. Wicksell was a Swedish economist who wrote at the turn of the century. He suggested that there was a "natural" interest rate, a rate at which the supply of savings would equal the demand for investment. If banks were in the process of creating money, they would supply additional funds to the loanable-funds market, and this addition would push the bank rate below the natural rate. In these conditions the economy would expand.

In Wicksell's model the natural rate, the demand curve for investment, and the supply curve of savings could not be observed. Further, banks conducted business by setting a rate at which they would loan funds, and if they felt that they were lending too much, they would raise that rate, and if they felt that they were lending too little, they would lower that rate. In this procedure banks were like any retailer who can change sales by changing price.

Suppose, said Wicksell, that bankers lowered their rate below the natural rate. Then borrowers would want to buy more funds, and spending in the economy would increase. Further, increased spending is infectious. As economic activity expands, businesses want to borrow more, and the natural rate would rise even higher above the bank rate. Hence a cumulative expansion would begin.

As the expansion continued, banks would find that their deposits would grow, but their legal reserves (usually in the form of gold in Wicksell's day) would remain the same. Ultimately banks would decide that the ratio of deposits to reserves had risen far enough, and would increase their interest rates to discourage borrowing. This action would set the bank rate above the natural rate and would set the stage for a self-feeding contraction.

Up to this point there is not much differ-

ence between Wicksell and Hawtrey. A change in money started the expansion, and monetary factors set the upper boundary of the expansion. However, Wicksell's framework also allows a change in investment to be the initiating factor, a possibility that Hawtrey downplays.

Suppose that the economy is at equilibrium, and that an innovation, such as the development of railroads or the automobile, increases the profitability of investment. As a result, the natural rate falls. Though banks keep the prices on loans at the old rates, there will be an increase in borrowing as the innovators and their imitators begin to invest. As the new investment projects are undertaken, business borrows. A self-feeding expansion gets underway. The expansion depends on an "elastic currency," the ability of the banking system to provide the extra funds needed to support the extra spending. But the elastic currency is seen as a passive element. The actual expansion is fueled partly by increased optimism, partly by the increased income and hence increased consumption which the new investment creates (a topic we consider in detail in the next chapter), and partly by the *accelerator* principle, which the next section examines.

Note that overinvestment theories do not directly oppose monetary theories. Most economists who formulated overinvestment theories also believed that the quantity theory of money was valid. Most overinvestment authors believed that without the expansion of bank credit, the expansion could not get started or continue long enough to become a boom. Further, the belief that the added investment which formed the main part of the boom was financed with new bank credit yielded a reason for an upper turning point.

The increase in investment was not financed by voluntary savings, but by funds which the banking system was creating. Hence there was a divergence between the structure of production and the flow of funds. The amounts which people wanted to save were less than the amounts which businesses wanted to invest. It is in this sense that there was "overinvestment." Once the increase in bank credit came to an end, which it had to do if the economy was to avoid ever increasing inflation, this divergence between desired savings and investment would reveal itself. Some businesses would be unable to finance their planned investment, the boom would come to an end. The same forces which propelled the upturn would now work in reverse to propel the downturn. Common in overinvestment theories was a belief that the boom was a result of unbalanced growth, and this unbalance set an upper turning point. The resulting recession "cleansed" the economy, and when properly "cleansed," it would hit the bottom turning point and turn upward again.

Wicksell's analysis, and the overinvestment theories which came from it, tied together the money market and the goods market. A disturbance could begin in either one. Linking these markets together was the interest rate and the financial markets.

Before 1930, economists concerned with how businesses plans to invest would be matched with people's plans to save usually developed some sort of overinvestment theory. But on the fringes of economics there was another theory. This theory suggested that the problem was that people would tend to save too much relative to the amounts businesses wanted to invest, or in other words, that people would "underconsume." Chapter 7 mentioned that this view was at the heart of a dispute between Thomas Malthus and most other economists of his day. No one developed a theory of business cycles around this view (though it was an element in several), for it was a theory not of a cycle but of depression. Few prominent economists of the 1920s could have guessed that the underconsumptionist view of the world was about to leave the fringes, move to the center of macroeconomics, and totally eclipse the overinvestment theories. Yet it did. The income-expenditure model which John Maynard Keynes developed had a strong underconsumptionist base. It will be the topic of the next chapter.

TABLE 1 INVENTORIES ADJUST TO SALES

MONTHLY SALES	MONTHLY PURCHASES	INVENTORY
$100,000	$100,000	$100,000
100,000	100,000	100,000
90,000	90,000	100,000
90,000	90,000	100,000
90,000	80,000	90,000
90,000	90,000	90,000

THE ACCELERATOR PRINCIPLE

The **accelerator** principle played a role in many business-cycle theories and continues today as a hypothesis explaining some of the fluctuations in investment. The accelerator principle says that small changes in consumer spending can cause big percentage changes in investment.

In a very simple form the accelerator principle assumes that the ratio of capital to output tends to remain constant. Suppose, for example, that normally it takes $1000 worth of equipment to manufacture $1000 worth of shoes each year. Suppose further that each year one tenth of the equipment wears out. Then if there is no growth or decline, total investment each year will be $100, all of which will be for replacement.

Now suppose that the sales of shoes jumps by 5%, to $1050 each year. The new desired amount of equipment will also rise by 5%, to $1050. However, to obtain this new level, investment will have to increase by 50%, to $150. Thus if firms desire a constant capital-to-output ratio, a small percentage change (either an increase or decrease) in final sales can lead to a big percentage change in investment.

The same logic can work with inventories (though the term "accelerator" usually only refers to the application of this logic to business investment in factories and equipment). Suppose that a business wants to keep an inventory of one month's sales. If annual

TABLE 2 U.S. GNP AND FINAL SALES, 1954-55

Year	Quarter	GNP	Final Sales
1953	I	$365.4	$363.0
	II	368.8	365.6
	III	367.8	367.1
	IV	362.6	367.1
1954	I	362.0	364.6
	II	361.8	364.5
	III	366.2	368.4
	IV	375.0	373.8

Source of Data: *National Income and Product Accounts of the United States, 1929-1974*, (U.S. Department of Commerce), p ll. (Data are in billions of dollars.)

sales are $1,200,000, it will want an inventory of $100,000. In a steady state, with no expansion or contraction of sales, it will order $100,000 each month to replace the goods it sells and to keep inventories at the desired level.

Now suppose that sales drop 10%, to $1,080,000 per year. Each month the firm will now sell only $90,000 worth of goods. If the firm immediately reduces monthly purchases to $90,000, it leaves inventories at $100,000. This pattern is shown in Table 1. As long as monthly sales just equal monthly purchases, the level of inventories does not change. To reduce inventories, purchases must drop by more than sales. Thus a 10% reduction in final sales will cause more than a 10% reduction in wholesale sales if firms want to keep their inventory-to-sales ratio a constant. The pattern works in reverse as well. A 10% increase in final sales will cause more than a 10% increase in wholesale sales.

The attractive aspect of using an accelerator-type of theory to explain investment is that there are sizable swings in inventories which follow business fluctuations. In recessions production drops more than sales as businesses reduce inventories, and during booms production rises by more than sales as businesses increase inventories. In fact there are some U.S. recessions during the years 1946 to 1960 in which much of the reduction in output was due to changes in inventories. Table 2 shows quarterly GNP and final sales for the years 1953 and 1954. Notice that from the second quarter or 1953 until the second quarter of 1954 GNP drops by $7 billion. However, final sales continue to rise until the fourth quarter of 1953, and only drop by $2.6 billion from then until the second quarter of 1954.

Final sales differ from GNP because of inventory changes. If final sales exceed GNP, businesses are reducing inventories, and if final sales are less than GNP, businesses are increasing inventories. In the 1953-54 period, businesses switched from inventory accumulation to inventory liquidation, and this change, more than any change in buyer demand, explains the drop in GNP.

Patterns of inventory movement such as those illustrated in Table 2 do not prove that an accelerator-like principle is involved; there are other possible reasons inventories may move in such a pattern. But the accelerator principle, applied both to fixed investment and inventories, is one aspect of business-cycle theory which is very much alive today.

CYCLES RECYCLED

Most economists abandoned the business-cycle framework after the introduction of the income-expenditure model in the 1930s. The income-expenditure model—discussed in the next chapter—encouraged economists to developed models which stressed equilibrium. This stress on equilibrium dominated macroeconomics during the 1950s and 1960s. Only in the 1970s did problems of the adjustment process return to center stage. Once economists started to worry again about adjustment, cycles reappeared because many assumptions yield cyclical adjustment patterns.

Supply and demand models, either of individual markets as in Chapter 4 or aggregated as in Figure 9.2, can help us see issues of adjustment. When there is a surplus in a supply and demand model, we expect pressure to decrease price. The larger the surplus, the greater that pressure should be. A shortage, on the other hand, will produce pressure to increase price. We will call the size of the surplus or shortage the *output gap*, and we will measure it in percentage terms.

If price is totally flexible, adjustment would be instantaneous, and the size of the output gap would not matter. Price adjustment, however, often takes time. The adjustment time depends partly on how *sticky* prices are, and partly on how big the output gap is. Therefore new price will be the old price plus an adjustment factor. The adjustment factor depends on how sticky prices are and the size of the output gap.

The supply and demand curves illustrated in Figure 2 have special properties to simplify calculations. The supply curve is vertical and

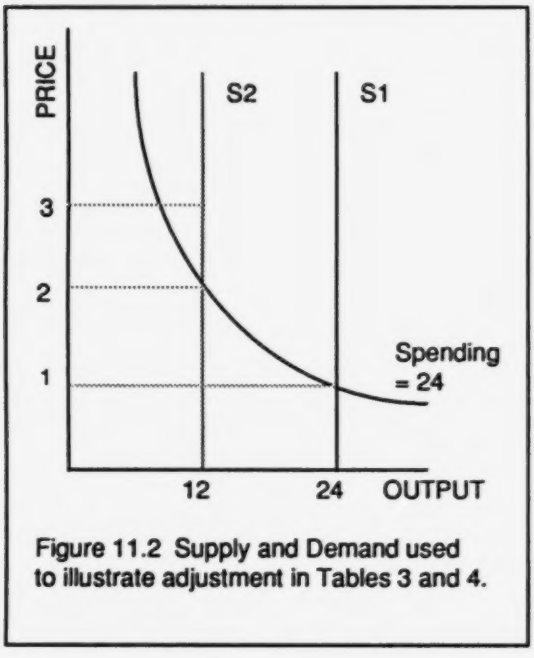


Figure 11.2 Supply and Demand used to illustrate adjustment in Tables 3 and 4.

the demand curve is a rectangular hyperbola. This demand curve gives people a fixed amount of spending. Because people spend a fixed amount of $24, they will buy 12 if the price is $2, but only 8 if the price is $3. With supply curve S2 and a price of $3, there will be a surplus of 4 (because 12 are produced and people only want 8). This surplus is 33.3% of the equilibrium output.

Table 3 shows some results that these curves and our adjustment process give for different levels of price stickiness. In each case we begin with an equilibrium of output at 24 and price at 1, and then shift the supply curve so the new equilibrium output is 12. When prices are very sticky, a big output gap makes price move only a little, so we approach equilibrium very slowly. In contrast, when prices are *slippery*, then small output gaps produce very large price movements, and the model will overadjust and generate cycles around the equilibrium output.

Why should prices be sticky? Production lags are one reason. Producers may need time to adjust output to a new level of prices. Another reason for price stickiness is that changes in prices can be costly to make. This reason makes sense if we interpret curves in Figure 2 as an aggregate supply and aggregate demand curves. Price changes irritate customers and reprinting price lists may be expensive. Chapter 13 will add other reasons for price stickiness.

The adjustment process yields more intriguing results if it depends not just on the

TABLE 3
ADJUSTMENT WITH DIFFERENT LEVELS OF PRICE STICKINESS

	Sticky prices a= .2		Flexible Prices a=.8		Slippery Prices a=1.1	
Period	Price	Output	Price	Output	Price	Output
0	1	24	1	24	1	24
1	1.2	20	1.8	13.33	2.1	11.43
2	1.36	17.65	1.96	12.24	1.99	12.06
3	1.49	16.13	1.99	12.05	2.00	12.00
4	1.59	15.09	2.00	12.01	2.00	12.00
10	1.89	12.68	2.00	12.00	2.00	12.00
11	1.91	12.54	2.00	12.00	2.00	12.00

Columns generated with equations:
Output gap = (output last year - equilibrium output)/equilibrium output;
Pt = Pt-1 + a(output gap)(Pt-1);
Output = Spending/Pt.

TABLE 4.
ADJUSTMENT WITH PRICE STICKINESS AND INFLATION CARRY-FORWARD

Period	Price	Output
0	1	24
1	1.8	13.33
2	2.68	8.96
3	2.79	8.60
4	2.22	10.83
5	1.81	13.22
6	1.80	13.34
7	1.95	12.30
8	2.07	11.58
9	2.08	11.54
10	2.02	11.89
11	1.97	12.15
12	1.97	12.16

Columns generated as in Table 11. except price level now is:
Pt=Pt-1 + a(output gap)(Pt-1) + b(rate of inflation)(Pt-1);
a = .8 and b = .5.

pressure from the output gap, but also on past price movements. If a firm has seen the price of its products rising by 10% each period, it may build in a 10% price rise in addition to whatever the output gap calls for. We will call this additional force the expected rate of inflation, and for simplicity assume that it is equal to last period's rate of price change.

With this addition, the current price depends on the old price, on the output gap and price stickiness, and on the expected rate of inflation. We can complicate this a bit it we add a carry-forward factor for expected inflation. If people expect inflation to be 10%, they may carry forward all of expected price change and mark up prices by the full 10%, or they may carry forward only part of it, or maybe none of it.

Table 4 shows how cycles can be generated with price stickiness and inflation carry-forward. By adding in effects from expected inflation, we give the adjustment process a momentum that makes it overshoot equilibrium. With extreme values, we can have the model completely unstable, so it will crash to zero or shoot off to infinity.

Real world adjustment processes are probably more complicated than the simple model in Table 4. However, they do not have to be much more complicated to give us results as complex as those we see in the real world. The frequency with which cycles appear in adjustment processes which seem based on reasonable assumptions has brought back the cycle to macroeconomics.

SUMMARY

Chapter 7 argued that two central issues of macroeconomics were where did the sources of disturbance exist in the system, and where might there be forces which prevent the system from quick and smooth readjustment when it is disturbed. This chapter has introduced the idea that instability of investment might be a source of disturbance. More important, however, has been the discussion in this chapter about why the economy may have problems in readjustment. It has shown that in a business-cycle framework, an economy once disturbed could continue fluctuating indefinitely. In this framework an economy is a system of bounded instability.

However, the central idea of business-cycle literature, that the economy has *regular* and *periodic* waves—a cycle—lasting for several years, has only a handful of adherents today. Perhaps such cycles never existed, or perhaps they once did but no longer do because the government now plays an active role in the economy. In either case, few economists try to explain recessions and recoveries in terms of cycles. It is somewhat ironic that many economists still use the term "business cycle" though they no longer believe in a cycle.

The business-cycle approach remains important because it is an easy way to introduce the adjustment process, and problems of adjustment are central in macroeconomics. The important issue of feedback, to

which we will return in a later chapter, is a problem of the adjustment process. The idea that the economy can develop momentum, which we in later chapters justify by discussing a variety of lags, is a phenomenon of the adjustment process. The problem unemployment can be explained as an adjustment problem. Even though the business-cycle framework has fallen to a lesser status than it once had, it is a framework which is easy to understand. It is a useful framework for introducing important macroeconomic issues of adjustment because alternative ways of approaching these issues are far less inviting.

QUESTIONS

1. Chile had a tumultuous economic record during the 1970s and 1980s. It suffered a major inflation and two severe recessions. Column 1 in the table below shows the annual rate of change in money stock for the years 1970 through 1983. The table also shows rates of inflation and changes in manufacturing output. However, the three blocks showing inflation and changes in output, labeled A, B, and C, are not in the right order. What is the proper order for these blocks? (Hint: The correct order is the one which is most consistent with the predictions of inflation that the quantity theory gives.)

Not only has Chile had wide variations in monetary growth, but it has had equally drastic changes in other aspects of economic policy. In November of 1970 Salvador Allende won the presidency and began to transform Chile into a socialist society by nationalizing industries and by discouraging private business in a variety of ways. He was overthrown in a military coup in September of 1973. The ensuing military dictatorship cut government control of the economy, denationalizing some industries,

YEAR	Percentage Change in Money		Percentage Change in Prices	Percentage Change in Manufacturing
1970	63%		35%	6%
1971	115		20	0
1972	151	A	10	-15
1973	316		27	5
1974	272		20	10
1975	257		33	0
1976	194		19	15
1977	108	B	77	3
1978	67		338	-4
1979	65		503	-4
1980	56		374	-28
1981	-6		212	5
1982	9	C	92	10
1983	27		40	7
1984	13		33	7

Source: Computed from data in *International Financial Statistics*, various issues.

and cutting regulation for others. One could expect that these large nonmonetary changes would be more important than the monetary changes. Given the data above, how much of the price changes seem to be explainable in terms only of changes in money? (Almost all, most, half, a bit, almost none?) How much of the changes in manufacturing output can be explained solely in terms of changes in money? Can more of the price movements or more of the output changes be explained in terms of money? (Comment: You might try graphing all three series together. A picture is worth a thousand words.)

2. Feedback comes in two varieties: positive feedback and negative feedback. Suppose an increase in variable A increases variable B. With positive feedback the higher value of B will work to make A even larger, but with negative feedback, the higher value of B will tend to decrease the value of A. Decide whether each of these cases of feedback below represents positive or negative feedback.

a. When income goes up, people spend more; when people spend more, income goes up.

b. When money stock is increased, price level rises; when price level rises, the amount of commodity money falls.

c. When the number of whales decreases, their price rises; when their price rises, people hunt more intensely.

d. When the number of cattle decreases, their price rises; when their price rises, producers produce more.

e. When people riot more, police respond with greater violence; as the police respond with greater violence, people riot more.

f. As a star collapses, its heat rises; the greater the heat, the more a star will expand.

g. The fatter John gets, the unhappier he is; the unhappier John gets, the more he eats.

h. As the oxygen in the blood declines, an animal breathes faster; as it breathes faster, the oxygen in the blood rises.

i. When prices rise, workers demand higher wages; as wages rise, producers increase their prices.

3. Which kind of feedback is stabilizing, positive or negative feedback?

4. Suppose that the firm which is illustrated in Table 1 in the text does not realize immediately that sales have dropped, and for two months continues to reorder at the old level of $100,000. It then realizes that the economic climate has changed and cuts purchases so it can reduce inventories to $90,000. Complete the table below to show this pattern.

MONTHLY SALES	MONTHLY PURCHASES	INVENTORY
$100,000	$100,000	$100,000
100,000	100,000	100,000
90,000	100,000	____
90,000	100,000	____
90,000	____	90,000
90,000	____	90,000

5. Simple models with interesting adjustment patterns can be constructed using the idea of contingent behavior discussed in Chapter 2. For example, suppose that Peter will wear a tie only if Ed did the previous day, Ed will wear a tie only if Peter did the previous day, and Matt will wear a tie only if Peter did the previous day.

a) On Tuesday Peter is wearing a tie and Ed and Matthew are not. What will the adjustment path be?

b) On Tuesday Peter and Ed are wearing a tie and Matthew is not. What will the adjustment path be?

c) On Tuesday Matthew is wearing a tie and Ed and Peter are not. What will the adjustment path be?

6. Suppose that the firm in Table 1 again has sales of $100,000 beginning in the seventh period. What will happen to desired inventories and to monthly purchases?

7. The chapter simplified the story of inventory adjustment by assuming that a business wanted to hold a constant fraction of sales as inventory. However, economic theory says that this is a poor business strategy.

The amount of inventory which is optimal depends on the costs and benefits of holding inventory. Holding inventory is a way of holding wealth. Another way to hold wealth is in a form which earns interest. The higher the interest rate, the higher the cost of holding inventories, and the less business should hold. On the other hand, there are benefits to holding inventories. The larger the average inventory, the less often a company must reorder. When sales increase, it should hold more inventory to partially offset the higher reordering costs. Using some clever mathematics, economists have found that

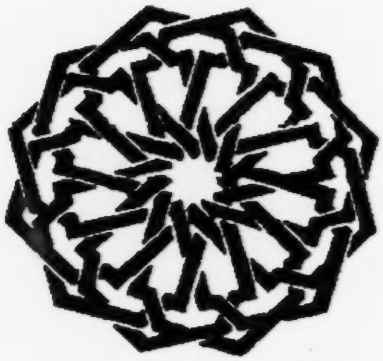
$$\text{Optimal inventory} = k(\text{sales})^{1/2}$$

where k is a number which depends on the interest rate and the costs of reordering. If the optimal level of inventory when sales are $90,000 is $90,000, then k = 300.

a. Using the formula for optimal inventory and k = 300, compute the optimal inventory when sales are $100,000.

b. Rework Table 1 in the chapter. Assume that monthly sales stay the same, and that the firm begins with its optimal inventory. (It will be the answer you got in part A, not $100,000 as in the table.) What number will replace the $80,000 in the table to bring inventory down to its optimal value of $90,000 in the fifth month?

c. Does the correction in this problem increase or decrease the instability caused by inventory adjustments? Explain.



CHAPTER 12

THE INCOME-EXPENDITURE MODEL

After you finish this chapter and work the questions at the end, you should be able to:

Define consumption function, marginal propensity to consume, marginal propensity to save, and paradox of thrift, fiscal policy.

Explain the logic of the income-expenditure model in terms of circular flow, leakages of spending, and injections of spending.

When given a simple income-expenditure model in the form of a table, find the equilibrium and compute the multiplier.

When given the multiplier in an income-expenditure model and a desired change in total spending, be able to predict the required change in exogenous spending.

In 1936 John Maynard Keynes published his *General Theory of Employment, Interest and Money*. Keynes, whose earlier work had made him one of the world's most respected economists, offered a new framework for approaching the questions of recession and unemployment. Arriving at a time in which most economists seemed confused about the state of economic affairs (recall that the 1930s were not a time of prosperity), the book revolutionized thinking about macroeconomics questions, sweeping before it the old business-cycle framework and the quantity theory of money.

There is controversy about what Keynes really meant. This controversy is of no importance to us. Though some economists argue that the development of "Keynesian" economics in the 1940s and 1950s involved distortions of the true message of Keynes, it is these developments which had become the conventional wisdom of economics by 1965. This chapter explores the mechanics and implications of the simplest "Keynesian" models which economists have used to explain problems of unemployment and recession.

The "Keynesian Revolution" emphasized the markets for goods and services as the primary source of macroeconomic disturbance and de-emphasized monetary and financial sources. (Recall Table 4 in Chapter 7.) The simple income-expenditure model in this chapter implicitly assumes that all interesting action takes place in the goods and services market. It assumes that all other markets adjust passively to events in the goods markets and that nothing which happens in them might interfere with happenings in the goods market. This is in sharp contrast to the quantity theory of money, which assumed that the most interesting action took place in the market for money balances, and what one saw in the market for goods and services was a result of changes in the amount of money. This assumption that others sectors are passive is important to keep in mind as you read this chapter and do its problems. Though at one time many economists thought it a realistic assumption, few do today, and hence most conclusions of this chapter will be altered in upcoming chapters.

THE SIMPLE MODEL

Suppose that a factory with a payroll of $500,000 locates in a small midwestern town. Suppose further that the $500,000 is the only money which the factory spends in the town, that all employees live in the town, and that each person who lives in the town spends exactly one half of his income locally. By how much will the income of the town rise as a result of the new factory?

The $500,000 will be an addition to town income. But the story does not end here because, by assumption, the people who earn the payroll will spend on half of the payroll, or $250,000, in town. This $250,000 will become income for the shopkeepers, plumbers, lawyers, teachers, etc. Thus town income will rise by at least $750,000. But the story does not end here either. The shopkeepers, plumbers, etc. who received the $250,000 will in turn spend one half of their new income locally, and this $125,000 will become income for other people in the community. Total town income is now $875,000. The process will continue on and on, and as it does, total income will approach $1,000,000.

Notice that the initial half million in income expands to one million once in the system. There is a **multiplier effect** which is similar to the multiplier effect in the model of contingent behavior discussed in Chapter 2. The size of the multiplier in our midwestern town depends on the percentage of income people spend within the community. The smaller the percentage, the more quickly the extra income leaks out of the economy and the smaller the multiplier. Question 4 at the end of the chapter asks you to compute the multiplier if people spend three-fourths of their income locally.

The income-expenditure model applies to the national economy the logic by which a new factory can increase town income by a multiple of its payroll. Central in the income-

TABLE 1
A CONSUMPTION FUNCTION

Expected Income	Consumption	Expected Savings
$10,000	$12,500	-$2,500
12,000	14,000	-2,000
20,000	20,000	0
30,000	27,500	2,500

expenditure model is an assumption about how people spend, the **consumption function**. The consumption function says that the amount people spend depends on their income, and that as income increases, so does consumption.

Table 1 illustrates a consumption function. It says that if people expect incomes of $10,000, they will spend $12,500. This amount of spending is possible if people plan to *dissave*, which means that they sell assets. The table says that when expected income is $30,000, people will spend $27,500 which means that they plan to save $2,500.

Table 1 shows that if expected income rises by $2,000, from $10,000 to $12,000, people will increase their spending by $1,500, or that they will only spend three-fourths of additional income which they expect to receive. This fraction of additional income which people spend has a special name, the **marginal propensity to consume** (or **mpc** for short). In Table 1 the mpc is always three-fourths. Thus if income increases by $8000, from $12,000 to $20,000, people increase spending by $6,000, from $14,000 to $20,000.

The marginal propensity to consume can be computed with the formula:

$$(1)\ MPC = \frac{\text{change in consumption}}{\text{change in income}}$$

In addition, economists often talk of the **marginal propensity to save**, which is the fraction of additional income which people save. Since people either save or consume additional income, the sum of the marginal propensity to save and the marginal propensity to consume should equal one.

The value of the marginal propensity to consume should be greater than zero and less than one. A value of zero would indicate that none of additional income would be spent; all would be saved. A value greater than one would mean that if income increased by $1.00, consumption would go up by more than a dollar, which would be unusual behavior. For some people a mpc of 1 is reasonable, meaning that they spend every additional dollar they get, but this is not true for all people, so if we want a consumption function that tells us what people on the average do, a value less than one is reasonable.

The consumption function can also be illustrated with an equation or a graph. The equation that gives the consumption function in Table 1 is:

(2) Consumption = $5000 + 3/4(Expected Income).

If people expect an income of $10,000, this equation says consumption will be:

(3) Consumption = $5000 + 3/4($10000) = $5000 + $7500 = $12500

which is the same result that Table 1 contains. Notice that one can see the marginal propensity to consume in this equation. It is the fraction 3/4. (The tables which follow in this chapter can also be expressed in terms of equations. See the appendix if you want the theory in an algebraic form.)

Figure 1 graphs the consumption function of Table 1 and Equation 1. Notice that the graph is a straight line with a slope of 3/4. If the slope of the consumption function,

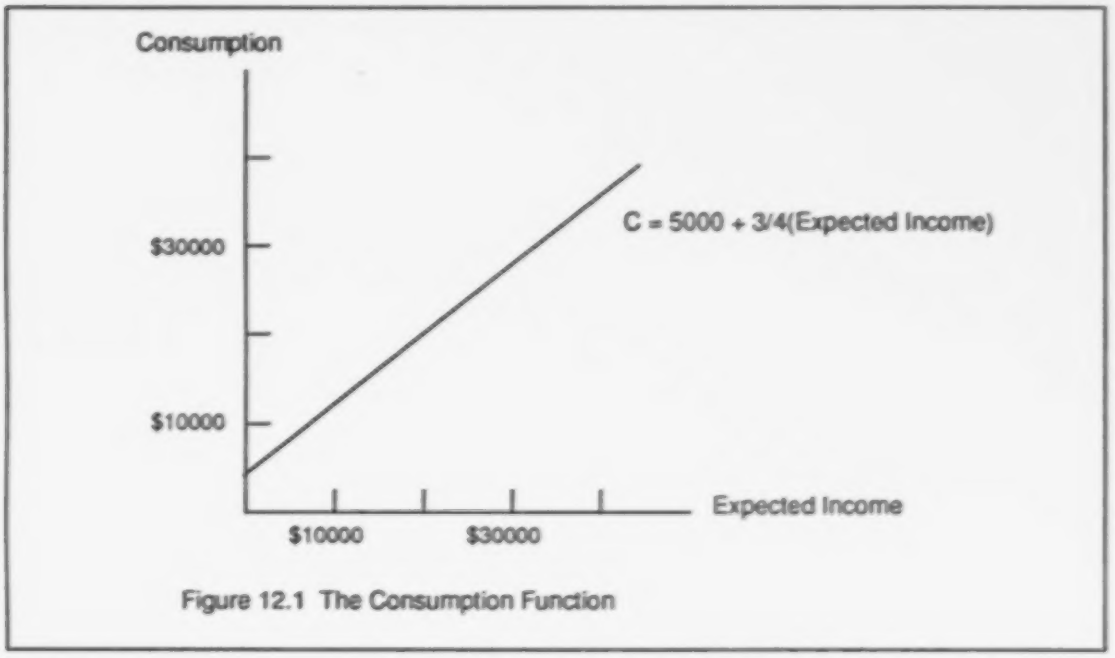


Figure 12.1 The Consumption Function

which is the mpc, never changes, the consumption function is *linear*. If the mpc changes as income changes, then the consumption function will be a curved line, or a *nonlinear* consumption function. The $5,000 term in equation 1 is shown on the graph as the *intercept*, which indicates the amount of consumption if expected income is zero.

When will this model be in equilibrium? To answer this, recall that spending by one person is income for another. Because Table 1 assumes that consumption is the only form of spending, the amount of consumption spending will equal actual income. If people expect income of $10,000 and spend $12,500, actual income will exceed expected income. It is reasonable to suppose that as a result people will change their expectations, and thus their behavior. The logical equilibrium condition in this model is that expected income should equal actual income.

In Table 1 we see that $20,000 will be equilibrium income. When people expect income to be $20,000, they act in a way to make their expectations come true. We can show the solution on a graph by adding a line that shows all the points for which actual income equals expected income. These points will form a straight line which will bisect the graph. Figure 2 shows this line as a 45-degree line. Equilibrium income occurs in the model when the spending line intersects the 45-degree line.

ADDING INVESTMENT AND GOVERNMENT

Consumption is not the only type of spending that exists; business spends in the form of investment, the government spends, and the economy has transactions with other nations. The government also taxes. Making these adjustments to the model increases its complexity, but does not change its logic.

What assumption should we make about how business makes investment decisions? There are a number of possibilities. We could assume that, like consumption spending, business investment decisions depend on expected income. The logic of the accelerator principle from the last chapter suggests this assumption. Or we could assume that the

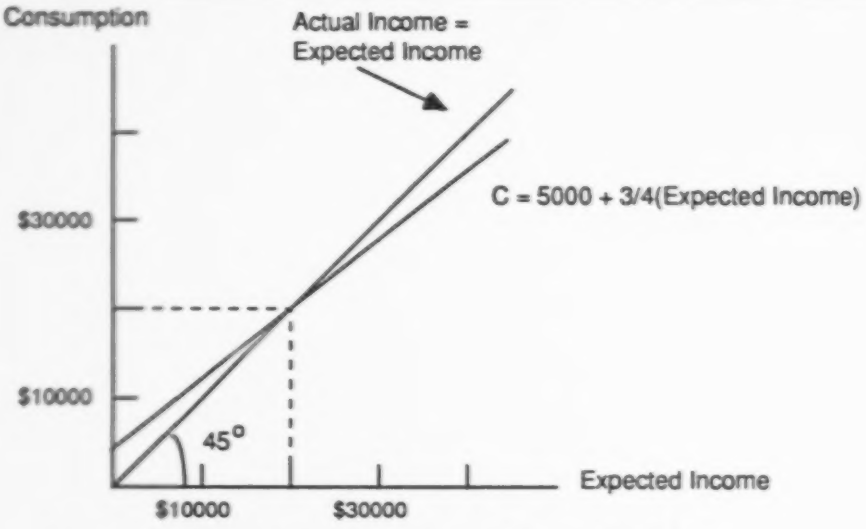


Figure 12.2 The 45-degree line shows where equilibrium lies

interest rate, which measures the opportunity cost of tying up assets in the form of capital, should matter. However, we will begin by making the assumption that is standard in textbook treatments of the model: investment is determined outside the model, or in the jargon of economists, that it is *exogenous*.

In Table 2 we have added investment spending to the model shown in Table 1. At an expected income of $20,000, consumers will spend $20,000 and expect to save nothing. Business will invest $2,500. Thus actual income will be $22,500 (and actual savings will be $2,500, matching investment). Since actual income will not equal expected income, expected income should change, causing behavior to change too. Not until expected income equals $30,000 will expected income equal actual income and only then will behavior stop changing.

Notice that the addition of $2,500 in investment increased the equilibrium from the $20,000 in Table 1 to $30,000 in Table 2. There is a multiplier effect here, and the multiplier is four. The reason for the multiplier effect can be seen intuitively. As the result of the addition of the $2,500 in investment, actual income rises by $2,500. Expected income will also rise. But at the new expected income of $22,500, people will want

TABLE 2
THE SIMPLE INCOME-EXPENDITURE MODEL WITH INVESTMENT

Expected Income	Consumption	Expected Savings	Investment	Actual Income
$10,000	$12,500	-$2,500	$2,500	$15,000
12,000	14,000	2,000	2,500	16,000
20,000	20,000	0	2,500	22,500
30,000	27,500	2,500	2,500	30,000

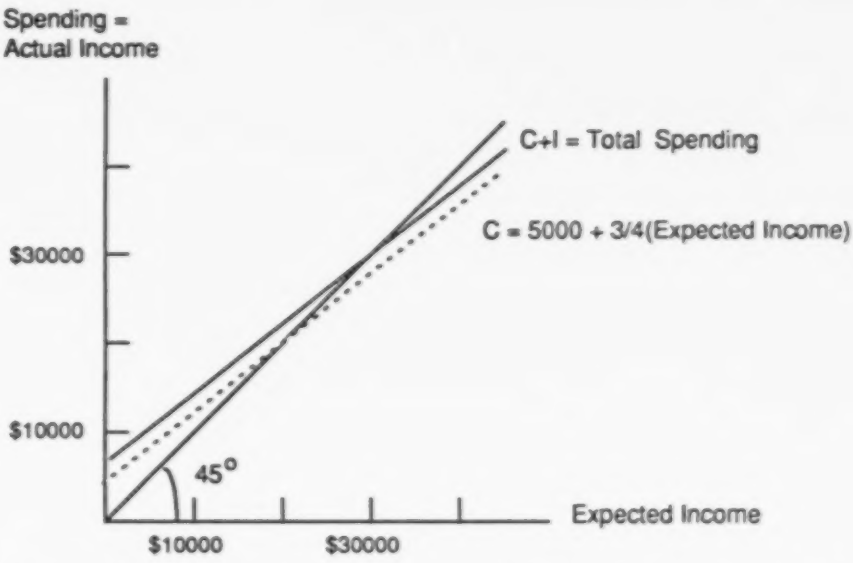


Figure 12.3 The income-expenditure model with investment and consumption.

to spend more than $20,000 for consumption, so there will be an additional *induced* increase in spending. But the story does not end here. The additional consumption increases actual and thus expected income, and changes behavior still further. The chain reaction which the addition of investment sets into effect diminishes at each step, and the total will approach $30,000.

This more complex model can also be illustrated graphically, and this is done in Figure 3. The only alteration is that the total spending line now includes investment as well as consumption. As before, the equilibrium exists when expected income equals actual income.

To complete the standard textbook model, we need to add government. Government affects the flow of spending in two ways: it adds spending in the form of government purchases of goods and services and it takes money from the flow of spending with taxes. Government purchases include payments for fighter planes, salaries of congressmen, and building of new highways. Not included in government spending are transfer payments such as Social Security payments, food stamps, or grants to needy college students. Transfers can be treated as negative taxes.

Government spending affects the model in exactly the same way as investment spending does, but the addition of taxes forces some changes in the way we have been presenting the model. Simply relabelling Table 2 shows the effect of adding government spending. The column titled "Investment" could be called "Investment Plus Government Spending." The column titled "Actual Income" would remain the same, but it would now be computed by adding together consumption spending, investment spending, and government spending. Because government spending enters the model in exactly the same way as investment spending, changes in it have the same multiplier effects as do changes in investment spending.

Adapting the graph to the addition of government spending is equally easy. The line in Figure 3 which is called "C+I" will now be called "C+I+G." Equilibrium will occur where this line crosses the 45-degree line.

TABLE 3
TAXES IN THE INCOME-EXPENDITURE MODEL

Expected Income	Taxes	Expected Disposable Income	Consumption	Investment	Government Spending	Actual Income
$12,500	$2,500	$10,000	$12,500	$500	$2,000	$15,000
14,500	2,500	12,000	14,000	500	2,000	16,000
22,500	2,500	20,000	20,000	500	2,000	22,500
32,500	2,500	30,000	27,500	500	2,000	30,000

Introducing taxes forces us to be more careful with the assumption we make about consumption. Realistically, people should base consumption decisions not on total income, but on disposable income. Chapter 7 showed that there were quite a number of adjustments that had to be made to go from total spending or GNP to disposable income. Some income never got to households because it stayed in the business sector as depreciation or as retained earnings, and there were a number of adjustments involving both taxes and transfer payments. For the sake of simplicity, we will assume that the only adjustment in our model will be taxes. Disposable income will then be total income less taxes.

The introduction of taxes and consumption which depends on disposable income forces us to redo our table. Table 3 shows how the needed changes can be made. From expected income in column one we subtract taxes to give us expected disposable income. The consumption decisions in column four are based on this expected disposable income. The next two columns showing investment and government spending are similar to the fourth column in Table 2. As in Table 2, we find what actual income will be at each level of expected income by adding together consumption, investment, and government spending. Since spending by some is income for others, this summation gives us total income, which is shown in the last column. Equilibrium in this table should exist when expected income equals actual income, which happens when actual income is 22,500.

If Table 3 is graphed, it will look very much like Figure 3. The only difference will be that the consumption line will be lower. Increases or decreases in taxes will change the relationship between expected income and consumption.

The addition of government spending gives government a role in determining the level of national income. When government increases its spending by $1.00, income rises by more than a dollar in this model because of the multiplier effect. When government increases taxes, expected disposable income decreases, and people reduce consumption. Through the multiplier process, national income falls by a multiple of the change in taxes. The use of changes in government spending or taxing with the goal of changing national income is called **fiscal policy**.

The multipliers for government spending and for taxes are not the same and Table 3 can help illustrate why they are not. As it stands, the equilibrium level of income in Table 3 is $22,500, which results when expected disposable income is $20,000. Suppose taxes are reduced to zero. What will happen to equilibrium income? The tax column becomes zero and expected disposable income would then equal expected income. We can then ignore the first two columns of the table and relabel the third column as expected income. Clearly the new equilibrium income will be $30,000. Thus a reduction of taxes of $2500 increases income by $7500 (from $22,500 to $30,000), or each dollar of tax reduction increases actual income by 3.

Suppose instead that government spend-

ing increased by $2500. Then the sixth column would have the value of $4500, and actual income would be larger in each row. In particular, in the fourth row, actual income would increase to $32,500. However, expected income in the fourth row is $32,500, so this row contains the new equilibrium values. Hence an increase in government spending of $2500 increases actual income by $10,000 (from $22,500 to $32,500), or each dollar of increased government spending increases actual income by 4.

Changes in government spending and taxes both have the same effects on consumption in this table. A one dollar increase in government spending increases consumption spending by three as does a one dollar decrease in taxes. The reason that they have different multiplier effects is that the change in government spending not only induces a change in consumption but also gets counted in spending, whereas the change in taxes does not get counted.

OTHER WAYS TO SEE THE MODEL'S LOGIC

The logic of the model which we have built can be seen in Figure 4. Consumption, investment, and government spending determine actual income. Actual income and taxes determine expected disposable income, and finally expected disposable income determines what consumption will be. The logic of this model is the logic of a feedback system which the previous chapter described.

Figure 4 helps show why a change in investment or government spending has a multiplier effect. A drop in investment, for example, begins by reducing actual income by the amount of the drop. Then the lower level of actual income changes expected income, and consumption also declines. Hence a $1.00 decline in investment will, according to the logic of this model, cause a decline in income of more than $1.00.

We argued that the equilibrium condition for this model is that expected income equal actual income. There is another way to look at this equilibrium condition which is often useful. Expected income can be divided into three parts. First some is removed as taxes, and then what is left is divided between consumption and expected savings, or:

(4) $Y_{exp} = T + C + S_{exp}$

We have also argued that actual income is made up of three types of spending: consumption, investment, and government spending, or:

(5) $Y_{act} = C + I + G$

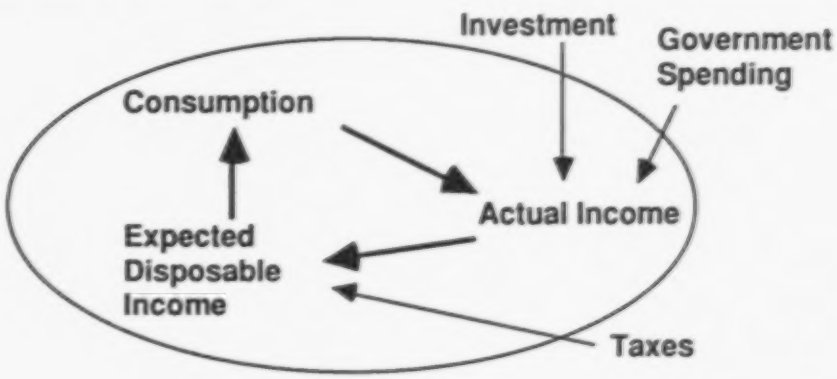


Figure 12.4 Cause and effect in the income-expenditure model.

In equilibrium these two equation are equal, or:

(6) $T + C + S_{exp} = C + I + G$

Subtracting C from both sides gives us the equilibrium condition in this form:

(7) $S_{exp} + T = I + G$

In words, this equation says that equilibrium exists at that level of income for which the amount people intend to withdraw from the flow of spending either as taxes or savings just equals the amount they intend to add to the flow of spending as investment or government spending.

This way of explaining equilibrium can be illustrated with an analogy to a leaky bucket. In the leaky bucket in Figure 5, higher levels of water create more pressure and thus faster leakage. An equilibrium level of water occurs when the leakage just equals the inflow of water. In the income-expenditure model, investment and government spending are inflows and taxes and expected saving are leakages. As income increases, so does leakage in the form of expected savings. Just as there will be only one level of water in the bucket for which leakages will equal inflows, so there will be only one level of income in the model for which leakages will equal inflows.

This alternative way of presenting the equilibrium condition can also be shown with a graph. In Figure 6 the difference between the C and the C+I+G lines is investment plus government spending, and Figure 7 graphs this distance separately as the I+G line. Because the distance between the C line and the C+I+G line is constant in Figure 6, the I+G line is flat in Figure 7. The difference between the 45-degree line and the C line is the difference between expected income and consumption, or taxes plus planned savings, which is graphed as the S+T line in Figure 7. Because the C line begins above the 45-degree line, the S+T line in Figure 7 begins with a negative value. It rises to zero when the C line crosses the 45-degree line, and then continues to rise as the gap between the 45-degree line and the C line widens.

Equilibrium exists when the C+I+G line

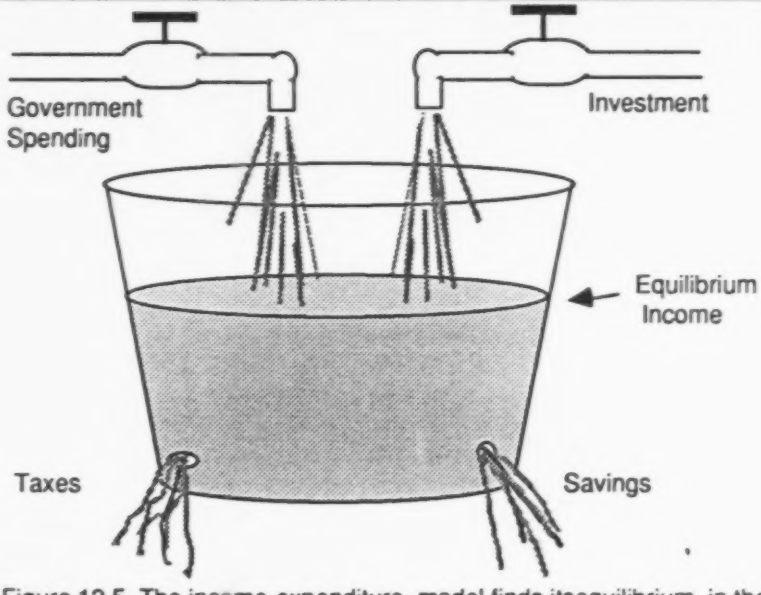


Figure 12.5 The income-expenditure model finds itsequilibrium in the way a leaky bucket does. Inflows must equal outflows.

Figure 12.6 The gap between the C and 45-degree lines is saving plus taxes, and the gap between the C and C+I + G lines is investment plus government spending..

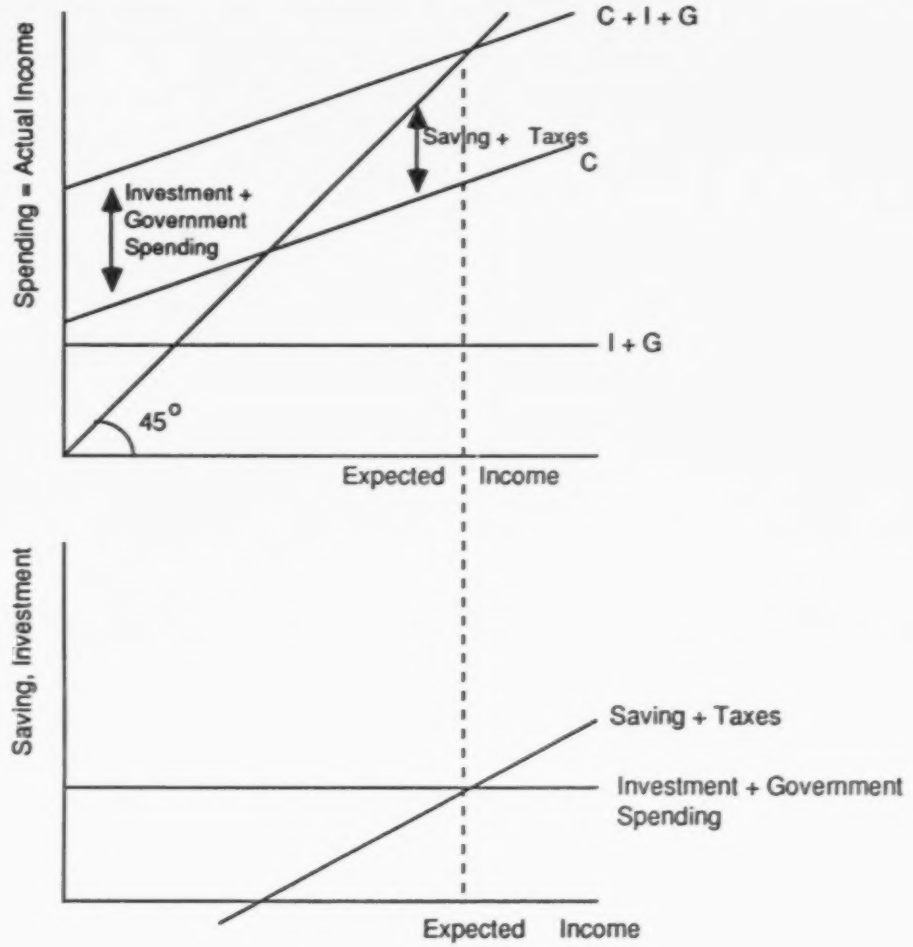


Figure 12. 7 Since at equilibrium savings + taxes = investment + government spending, here is another way to graph it.

crosses the 45-degree line. At this level of expected income, the distance between the C and the C+I+G lines (which is investment plus government spending) just equals the distance between the C line and the 45-degree line (which is savings plus taxes). Thus equilibrium exists when investment plus government spending equals expected savings plus taxes.

Up to now we have had consumption depend on *expected* income. This way of developing the model helps illustrate its relationship to the models of contingent behavior in Chapter 2. In both cases behavior of people depends on their expectations of other people's behavior. It also gets us ready for more

complex forms of the consumption function which we will meet in a later chapter. However, there are at least two other ways to develop the model, and each has advantages.

One alternative is to replace expected income with the income of the last period. Consumption would then depend on last period's income, and equilibrium would exist when this period's income equaled last period's income. This alternative is very close to the method of development above, but it makes explicit how expectations change. Expected income is last period's income.

The second alternative is to stress that income is the result of production, an idea which we met in discussing GNP in Chapter 7. Based on the incomes they receive, people make expenditure plans. Thus, instead of saying that consumption depends on expected income, we can say that planned consumption depends on actual income. If people plan to buy more than is produced, someone's plans must be thwarted. Equilibrium exists when planned expenditures equal income (which is output).

Thus suppose that when income is $20,000, consumers plan to spend $20,000 and business plans to invest $2,500. Since only $20,000 worth of goods has been produced, and more than $20,000 is being purchased, inventories must decline. But inventories are part of investment, so actual investment must differ from planned investment. When planned expenditures exceed production, inventories are depleted, which businesses do not want to happen. They will respond by increasing production, and in the process will hire more resources which will increase income. (They could also increase prices, but the model does not give them this option. In the model, all variables are in *real* terms.)

The advantage of this second alternative is that by involving inventories in the adjustment process, spending is linked to production. Adjustment takes place because the plans of businesses are disrupted. In contrast, when consumption depends on expected income, adjustment takes place because the plans of consumers are disrupted. Since we are mostly interested in what this model says about equilibrium, we will not pursue this distinction.

SOME IMPLICATIONS OF THE MODEL

The logic of the model leads to an important result called the "paradox of thrift." Suppose people decide to become more thrifty, that is, they decide to save more at each level of income. One expects that this would increase the total amount of savings, but in this model there is an unexpected result: total savings will remain the same and income will decline.

There are several ways to see why the model has this unexpected result. If people become more thrifty, they consume less at each level of expected income. In Figures 6 and 7 this increased thriftiness can be illustrated as a shift downward of the consumption function and a shift upward of the savings function. If you draw in these shifted lines, you will see that equilibrium income will fall. But since in equilibrium savings plus taxes must equal investment plus government spending, and because by assumption investment, taxes, and government spending are fixed, in equilibrium savings cannot change. In fact, if we allowed investment to increase a bit with income (but not by too much, or we will have problems in the model—see question 1 after the appendix), then the investment line in Figure 7 would slope upwards a bit. At the new equilibrium caused by increased thriftiness, savings would actually be less.

Another way to illustrate the paradox of thrift use the analogy of the leaky bucket. Consider what will happen if the savings hole in the bucket is made a little larger, which corresponds to people becoming more thrifty. Initially there will be a larger flow of water out. But this cannot continue indefinitely. Equilibrium exists when the inflow equals the outflow, and the inflow has not changed. This means that the water level must drop so

that the pressure forcing water out the bottom will be reduced. Less pressure means less outflow, and at some lower level of water equilibrium will be re-established. (The appendix shows how the the paradox of thrift can be illustrated algebraicly.)

The paradox of thrift contains an important prediction by the income-expenditure model of an unintended consequence. Prior to Keynes, most economists had argued that savings were helpful to the economy. Savings resulted in greater investment, and larger amounts of capital meant that the economy would be able to produce more. A slower rate of savings would reduce the growth rate of the economy. In contrast, the paradox of thrift implied that more savings could harm the economy. Many early followers of Keynes, and probably Keynes himself, were "secular stagnationists" who believed that a lack of spending was likely to be a chronic problem in an industrialized economy. Thus they thought that measures should be taken to reduce savings. Since the rich did most of the saving, an obvious solution was to tax the rich to reduce their incomes and thus their savings. Those who had wanted to tax the rich with the goal of equalizing incomes had, prior to Keynes, been confronted with the argument that such a move would have harmful effects on growth. It is not surprising that they were often eager to embrace a theory which implied that equalizing incomes had only good side effects. (The tendency for macroeconomic theories to be popular or unpopular as much for their political implications as for empirical support has existed for all theories, not just the income-expenditure model.)

A second important implication of the model is that it suggests that the government needs to take an active role in an economy. Keynes rejected the view of Adam Smith that, left alone, a market system generally functions well, or that the "invisible hand" works. An important reason for the pessimistic views of Keynes was his assumption about prices.

The income-expenditure model suggests that what happens in the market for goods and services is the key to understanding macroeconomic problems. But in analyzing the market for goods and services, it makes no mention at all of prices. Price level is not determined within the model, and generally it is assumed to be constant. Assuming fixed prices takes away the primary way that adjustment to equilibrium happens in microeconomics.

Assuming prices constant or fixed makes the model mesh poorly with microeconomic theory. If there is unemployment, microeconomic theory suggests that wages will fall, and this will change the amount of unemployment. If we want to assume that prices are in fact not very flexible, we need to carefully justify this assumption in some way to make it compatible with microeconomic theory. (The next chapter will explore some of the possibilities.) However, for many years this assumption was not properly justified, and as a result, microeconomics and macroeconomics were largely independent fields of study. The independence of the income-expenditure model from price theory was illustrated in textbooks of the 1950s and 1960s when discussion of macroeconomics preceded discussion of price theory or microeconomics. (Tradition has preserved this ordering in many texts—textbooks are a conservative force in economics.) One does not need to know anything about price theory to understand the simple income-expenditure model.

To see the problem that fixed prices give us, let us put the simple income-expenditure model into an aggregate-supply aggregate-demand framework similar to that we used when we discussed the quantity theory. In the income-expenditure model price level is fixed but output is flexible, so that the aggregate supply curve is a horizontal line in Figure 8. Aggregate demand is in terms of real output, so that the C+I+G value represents aggregate demand, a vertical line in Figure 8. Price level must be determined outside the model, and any change in aggregate demand changes output.

The perfectly flat aggregate supply curve is a problem in the model because it keeps the model from saying anything about inflation.

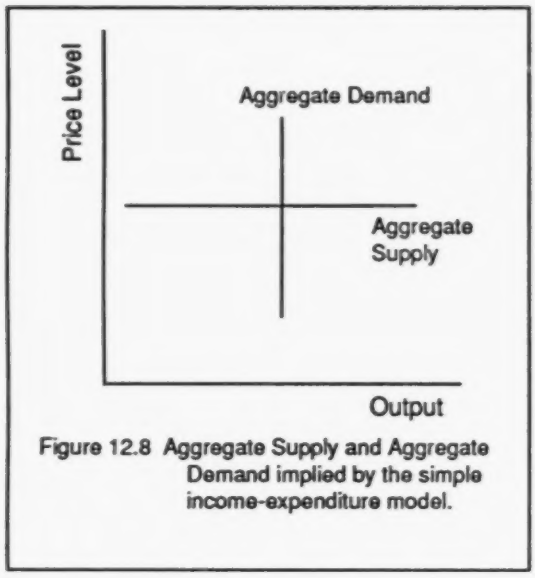


Figure 12.8 Aggregate Supply and Aggregate Demand implied by the simple income-expenditure model.

In the next chapter we will see how this assumption of fixed prices was modified in the 1960s. Even with modifications, there are many possible equilibrium outputs but only one level of real output which is consistent with full employment. Hence the model implies that there is no tendency for an economy to have an equilibrium of full employment. Rather the model says that an economy can have an equilibrium level of output with large amounts of unemployment. So clearly the income-expenditure model implies that the government should take an active role in managing the macroeconomic behavior of the economy. If the economic system has no tendency to move to full employment, then the government should use its tools of fiscal policy to control, or even "fine tune," the workings of the economy.

SUMMARY

This chapter introduced you to the logic of the income-expenditure model, a model which is based on the work of John Maynard Keynes. It showed that the structure of this model is identical to the structure of the model of contingent behavior which Chapter 2 introduced. It developed the logic and implications of the assumptions that spending depends on expected income, and that equilibrium exists when spending equals expected income.

QUESTIONS

1. Suppose the economy runs according to this income-expenditure model:

Expected Income	Expected Taxes	Consumption	Saving	Investment	Government Spending
160	0	150	10	30	0
200	0	180	20	30	0
240	0	210	30	30	0
280	0	240	40	30	0

(a) If people expect disposable income to be 160, what will actual income be? ____ What will happen to expectations? Where will actual disposable income equal expected disposable income? _____.

(b) The marginal propensity to consume is _____.

(c) The marginal propensity to save is _____.

(d) When income is 240, the average propensity to consume is _____.

(e) For equilibrium income to increase by 40, investment must increase by _____.

(f) Therefore the multiplier is _____.

2. Complete the table below. Then answer questions (a) through (f).

Expected Income	Expected Taxes	Consumption	Saving	Investment	Government Spending
190	10	162	18	8	20
250	—	207	27	20	20
310	22	—	36	32	20
370	28	297	—	44	20
430	34	342	54	56	20

(a) The equilibrium level of income will be _____.
(b) The marginal propensity to invest is _____.
(c) The marginal propensity to save is _____.
(d) For equilibrium income to increase by 60, government spending must increase by _____.
(e) The government spending multiplier is _____.

3. Normally the marginal propensity to consume should be between zero and one. a) How would people act if their mpc was greater than one? Do you know anyone who acts that way? b) Suppose the marginal propensity to consume were negative. What would this mean in terms of people's behavior?

4. Suppose a new factory is established in a small Indiana town. The factory has a payroll of $500,000 which is the only money it spends in town. All employees live in the town, and each person who lives in town spends exactly three fourths of his income locally. By how much will town income rise?

5. In the middle of the 14th century the Black Death first visited Europe, and in the following decades it made repeated visits. The plague destroyed about one third of the population, but did not destroy land, capital, housing, or money. What does the simple income-expenditure model predict would happen as a result of the plague to output and price level? (Hint: Use Figure 8.)

APPENDIX: OTHER WAYS TO DEVELOP THE MODEL

For those who are comfortable with simple algebra, the easiest way to develop the income-expenditure model is in terms of equations. Equation 1 in the chapter gave us the consumption function. The equilibrium condition we began with was:

(8) expected income = actual income

Since we began by assuming that the only form of spending was consumption, and because spending is equal to actual income because one person's spending is anothers income, we have this definition:

(9) actual income = consumption.

Substituting the consumption function for actual income in equation 3 gives:

(10) expected income = $5000 + (3/4)(expected income),

which yields, with a bit of algebra, our result from Table 1:

(11) (1-3/4)(expected income) = $5000

or:

(12) expected income = 4x$5000 = $20000.

Adding investment only slightly alters the equations which represent the model. The equilibrium condition now includes investment as part of actual income:

(13) Expected Income>Actual Income = Consumption + Investment

The consumption function remains the same as equation 1. The model now needs another equation, one to describe investment behavior. The assumption used in Table 2 was:

(14) Investment = $2500

Substituting equations 1 and 14 into equation 13 gives:

(15) Expected Income = $5000 + (3/4)(Expected Income) + $2500

or:

(16) (1-3/4)(expected income) = (1/4)(expected income) = $5000 + $2500.

or:

(17) expected income = 4($7500) = $30000.

Notice that the multiplier of four shows up in equation 11 and that equilibrium income equals the multiplier times the exogenous spending in the system (the $5000 and the $2500). You can see in equation 10 that the mpc determines the size of the multiplier in this model. If, for example, the mpc in equation 9 was 2/3 rather than 3/4, the multiplier in equation 11 would be three rather than four. In very simple models (but *not* in more complex models such as that shown in Question 2 at the end of the chapter) the multiplier will be 1/(1-mpc).

The paradox of thrift can be demonstrated in this simple model which excludes government using equation 7 as the equilibrium condition. To solve for equilibrium, we must find the savings function. Using the fact that expected savings is the difference between expected disposable income and consumption, and the consumption function in equation 1, we can find the savings function for Table 1 as:

(18) S = Y - ($5000 + (3/4)(expected income))

or:

(19) S = 1/4(expected income) - $5000.

The one-fourth in this equation is the marginal propensity to save, the fraction of additional disposable income which people will save.

If people become more thrifty, they save more and consume less at each level of income. The 5000 in equations 1 and 18 becomes a smaller number. Suppose that it becomes 4000. Then substituting our revised savings function and the investment

equation 14 into equation 7, we get:

(20) I+G = $2500 = (1/4)(expected income) - $4000 = S+T

or:

(20) $6500 = 1/4(expected income)

or:

(21) $26000 = expected income.

Comparing the new equilibrium income to what we had in Table 2, we find that an extra $1000 of thriftiness results in a $4000 drop in income (the multiplier was at work again). Savings remain at $2500.

Adding taxes complicates the consumption function. Taxes (abbreviated T) will create a gap between the total income of the nation and the disposable income which people can spend or save. Thus the consumption function is changed, with the revised consumption function assuming that consumption depends on expected after-tax income, or:

(22) C = a + (mpc)(expected income - taxes)

where the "a" term is the intercept. (It took the value of $5000 in equation 1.) Two other equations must be added to the system to explain the behavior of government. The simplest assumption for both government spending and taxes is that they are determined outside the system as policy variables, or:

(23) G = g

(24) T = t

The solution to this revised set of equations is straightforward. First, recall that the equilibrium condition is that expected income equal the sum of consumption, investment, and government spending. Then suppose that government spending and taxes are both $1000, that investment is fixed at $2500 as before, and that the intercept and mpc in the consumption function remain $5000 and 3/4, respectively. The substituting into the equilibrium condition, we get:

(25) expected income = $5000 + (3/4)(expected income - 1000)+2500+1000

or:

(26) expected income = 4($5000 + $2500 +$1000) - 3($1000) = $31000.

You might have noted that the way we divide spending into parts is based on the way GNP can be split into its uses which Chapter 7 discussed. The income-expenditure model tries to determine the size of each slice of GNP and then adds them together to discover the whole. We have not up to now included net exports, and for completeness they must be included. Exports act as an injection of spending into the system, while imports act as a leakage of spending from the system. Many textbook models eliminated net exports by assuming that the economy is "closed," which means that it has no imports or exports.

Finally, you might also notice the similarity of equation 7 to equation 6 in Chapter 7, which said that

(27) (I-S) + (G + Transfers - T) + Net Exports = 0

In the simple income-expenditure model, the only one of these variables which can adjust is savings, and the only way it can adjust is through a change in income. Thus if investment or government spending or net exports fall, the income-expenditure model asserts that income must also fall, because this is the only way it allows for savings to change. No modern economists believes a model this simplistic; they give some roles to changes in interest rates and prices for reasons we will see in upcoming chapters. But economists who believe that the income-expenditure model captures an important part of the story stress the adjustments in savings caused by changes in income.

QUESTIONS

1. Suppose we have this model: C = .9(expected income) I = -30 + .2(expected income) actual income = expected income a) What will be equilibrium income? b) Is there anything unusual about the equilibrium?

2. Suppose one has a simple model such as that in equations 9 to 11 in the chapter. What would the multiplier in this model be if the mpc is .9? If the mpc is .5? If the multiplier is 6 in this model, what is the mpc?

3. Redraw the bucket of Figure 5 showing the addition of imports and exports.

CHAPTER 13

THE LABOR MARKET

After you read this chapter and work the questions at the end, you should be able to:

Explain how the demand curve for a resource is derived from the product markets.
Describe the Phillips curve and the early interpretation of this curve.
Explain why the Phillips curve was considered an important addition to macroeconomics in the 1960s.
Summarize the conditions under which an employer will hire more of a resource.
Explain what happened to the Phillips curve as the 1970s unfolded.
Explain why the long-run Phillips curve may be vertical.
List possible reasons why wages are sticky downward.
Distinguish between frictional and structural unemployment.
Diagram and explain the model of search.
Explain the conditions needed for search time to be of optimum length.

Resource markets have traditionally remained in the background in macroeconomics. The ISLM model, the standard macroeconomic model for over thirty years, ignores them, and many textbooks have hardly mentioned them. The reason for this background role is that few economists believe that economic disturbances normally *originate* in these markets, and much of the controversy and focus in macroeconomics has been on the origin of disturbances. Yet resource markets play key roles in macroeconomics, and any discussion of the subject which ignores them is incomplete. They are the markets in which people obtain most funds they spend. They are also the markets in which we see the major problem of recession, unemployment. Finally, because at times these markets seem to adjust very slowly to disequilibrium, they determine the path which output and prices take as a result of disturbances which originate in other markets.

Economists generally focus on the largest resource market, the labor market, and ignore the others. This chapter will follow that practice. The other resource markets for land and various sorts of capital do not differ greatly from the labor market in theory, though they may be simpler because when people sell their labor services, they in a way sell part of themselves. In discussing the labor market, we discuss an aggregated and thus somewhat artificial market in which we assume that we can combine lawyers and teamsters and janitors and accountants into a single item called "labor."

DERIVED DEMAND

Though economists did not formally develop the ideas of economic aggregation prior to the 1930s, they used them much earlier. An aggregated market which they discussed, and one which they saw as a problem market in conditions of recession, was the market for labor services, or the labor market. On the basis of their understanding of this market, they often suggested that flexibility of prices and wages could cure any fall in output and employment which a drop in total spending might cause. To see why wage flexibility was considered so desirable, we need to explore the idea of **derived demand**.

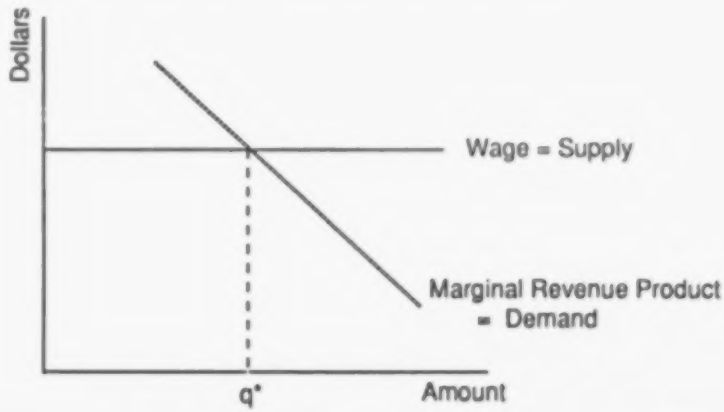
A profit-maximizing employer will hire any resource which produces greater value for him than the resource adds in cost. (This is one way of stating the profit-maximizing condition of the firm. See Chapter 10 in volume 1.) For simplicity we will assume that the added cost equals the wage or price of the resource (which implies that the buyer of the resource is a price taker). The value which the resource contributes depends on two things: how much output increases, and the extra revenue that each unit of the extra output brings to the firm. To recast this idea in the jargon which economists enjoy, one can say that the marginal revenue product (MRP) of the resource equals the marginal product (MP) of the resource multiplied by the marginal revenue (MR) of output, or in equation form:

(1) MRP = MP x MR.

A numerical example may help clarify the idea involved here. Suppose a firm in the garbage-pick-up industry has a fleet of trucks and must pay workers $10.00 per hour. If the firm receives $1.00 for each pickup, and adding another worker will allow it to make 12 more pickups per hour, is it worth while to add another worker? Using the rule discussed above, one sees that the extra value to the firm is 12 x $1.00 or $12.00. The extra cost to the firm of hiring another worker is $10.00. Hence, it is in the interests of the firm to add the extra worker. After this worker is added, the firm may find that adding another worker will add only nine extra pickups an hour. In this case it is not worth adding an extra worker because to buy an extra $9.00 of income costs $10.00.

The marginal revenue product of a resource is in fact the firm's demand curve for the resource. Since the law of diminishing returns says that the marginal product of a resource should decline as more and more of the resource is used, (which can justify the

Figure 13.1 A firm tends to hire until wage equals MRP.



drop in garbage pickups from 12 to 9 in the previous paragraph), the demand curve should slope downward to the right. Such a demand curve is shown in Figure 1. The profit-maximizing amount or labor to hire in this Figure is q*.

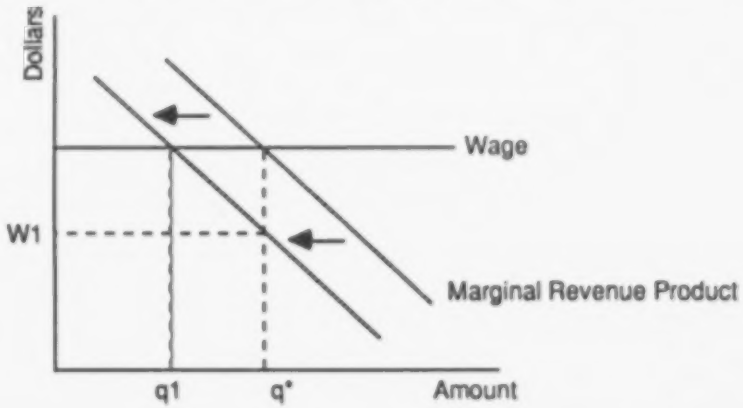
Suppose that for some reason people become less willing to buy the product that the firm is producing. This will affect the demand for resources because this demand is *derived* from the demand for output. In terms of equation 1, the drop in the demand for the product affects the marginal revenue of output. This means that even though the resource is as productive as it was before, it now brings less value to the firm because the output it produces is less valuable. In terms of the graph, the drop in marginal revenue of output shifts the demand for the resource to the left. If the wage does not change, the new equilibrium level of resources hired will be q1 in Figure 2, and this will be achieved by laying-off or firing q1-q* of the resources.

However, the resources used by the firm do not need to be reduced if the wage or price of the resources falls. If in Figure 2 the wage falls to W1, the same quantity of the resource will be used as was originally used. (Actually, the condition is a bit stronger. All resource prices must fall, not just that of labor. The prices of other resources are determinants of the demand curve of any resource.) Thus if wages or prices of resources are fixed, the amounts used will vary, while if the amounts used are held constant, then wages and prices must be allowed to vary.

The same idea can be seen in our garbage problem. If people suddenly reduce the demand for garbage service, and as a result the firm only gets and extra $.80 for each pickup rather than a $1.00, (notice that this assumes price flexibility), then the extra worker who added 12 pickups will no longer be worth hiring. Hiring him will still cost $10.00, but now this expenditure of $10.00 only brings the firm $9.60 of extra revenue. For the firm to hire the same number of workers, wages must fall (or marginal productivity must rise).

For an individual firm there is no reason to expect the wage to change. The supply curve is horizontal because each firm is competing with many other firms in different industries for workers. However, when markets are aggregated, this role of competition is eliminated. The supply of labor will no longer be horizontal, but should slope sharply upward. When the demand for goods drops, less labor will be demanded at old wage rates. The surplus labor should lead to a drop in

Figure 13.2 A shift in MRP changes wages and the amount hired



wages until unemployment is eliminated. In fact, if wages and prices are perfectly flexible, any drop in spending will cause a drop in prices but no change in output. In such a world output is not determined by aggregate demand, but by technology and resources. It is the world which Figure 2 of Chapter 9 describes. There would be no recessions in such a world, only inflations and deflations. However, if wages and prices are not flexible, then a change in total spending will affect output and employment. The pre-Keynesian economists were well aware that wages and prices did not change readily, and considered this inflexibility a major problem.

WHY ARE WAGES STICKY?

One question that the previous section raises is why a reduction in demand leads to a reduction in output rather than a reduction in prices and wages. Though in the the early 1980s there were a fair number of workers who accepted reductions in wages and benefits in the hope of protecting jobs, this adjustment is relatively uncommon. Rather it seems more common to protect wages and sacrifice workers. There are several reasons that this latter pattern is more common than the former.

One reason involves cases in which a union vote is necessary to change contracts. If the choice is between no reduction in compensation with a 40% reduction in workforce, or a 5% reduction in compensation with no reduction in workforce, the former option may win if the 60% of the workers who will keep their jobs are easily identified. Since layoffs are usually determined by seniority, those who will keep their jobs are usually identifiable. Hence, it is not in the interests of workers with a great deal of seniority to vote for any reduction in compensation unless the very survival of the organization is at stake.

However, the majority of wage agreements are made without union involvement. In these agreements reductions in compensation are also uncommon. Even if the threat of a strike does not exist, workers have other options. They can leave the company if they are unhappy with compensation, and those who could move most easily are the most qualified. High turnover can raise costs if there are training costs. In addition, morale is a factor in determining productivity, and any agreement forced on workers can have effects on morale that might eliminate any advantage which the organization receives from lower

wages.

Suppose that management of a company comes to its workers and announces that because of difficult economic conditions, it believes that a 10% reduction in wages is in order. How will workers react? They will have considerable reason to doubt management, because a reduction in compensation will always increase profitability. Therefore, management always has the incentive to ask for lower wages whether or not a reduction is justified by poor economic conditions. The workers do not know whether or not management has seriously tried other methods to reduce costs, or even if there is any condition of economic difficulty. Hence, workers often disbelieve statements that pay cuts are needed, and fight attempts to cut wages.

On the other hand, when management announces that due to economic difficulties it must lay off 10% of the workforce, there is usually no reason to doubt their sincerity. Cutting workforce will cut output, and in normal periods this cut will reduce profits. Since the *potential for abuse* does not exist in allowing companies to adjust work schedules, but a potential for abuse does exist if companies are allowed to adjust pay schedules at will, workers permit companies the former right but resist with whatever means at their disposal the second.

A final reason that workers may be unwilling to accept a cut in pay is that they believe that their current wage is an accurate measure of what they are worth. They believe that they could leave their present job and find another that will pay them as much. If their wage is cut, they could stay in their present jobs, but that would mean that they would be receiving less than they were worth; the firm would be "exploiting" them. However, leaving and searching for a new job is costly, involving time, risk, and adjustment to a new workplace. Since neither alternative, staying with lower pay or a job search, is attractive, workers resist pay cuts.

One might argue that the above discussion does not explain why an employer cannot simply discharge all workers and hire new ones if there are plenty of available applicants willing to accept lower wages. There are in fact situations in which this can and does happen—the use of migrant farm workers is an example. However, most firms cannot hire unskilled labor to perform all tasks; they need trained workers. Replacing trained workers will be expensive if new employees are less productive than old ones because of on-the-job learning. In attempting to hire these new employees, the firm has another expense. It must separate (or *screen*) those applicants who are qualified from those who are not, and this process involves expense. (See Chapter 12 of volumne 1 for a discussion of screening.) Also, the law gives certain privileges (or rights) to workers so that discharging them can be expensive. The employer may have to pay either sums to the discharged workers or higher unemployment-insurance payments. Finally, discharging workers raises a risk of violence and destruction of the employer's facilities.

Much of the logic of the paragraphs above has been systematized in a group of theories which Chapter 12 in volume 1 discussed briefly. That chapter argued that if quality of labor depends on wage, then an equilibrium wage might coexist with some level of unemployment. In these theories a reduction in demand for labor does not necessarily lead to a reduction in wages.

The purpose of the above discussion is to point out reasons why wages do not fall readily. It is not meant to convince you that wage rates can never fall. They have. From 1929 to 1933, the average wage of production workers in manufacturing fell by about 20%. It is probably that with comparable levels of unemployment, wages would fall even today. If workers are convinced that their choice is to accept lower wages or have the firm collapse, they will in many cases accept lower wages. The point of the above discussion is to suggest that until a firm is facing the prospect of bankruptcy, it finds cutting wages very difficult.

The problem in the labor market is not symmetrical; workers are willing to take higher wages readily to adjust to an increase in demand. Employers may not want to in-

crease wages, but either they must or they will lose both existing workers and high quality applicants. When spending increases rapidly, there are fewer rigidities in the labor market and prices and wages will respond more readily than they would to a fall in demand. There still will be some lags; the next two sections of this chapter explain them.

FULL EMPLOYMENT

The model of supply and demand leads one to the conclusion that when a market is in equilibrium, there should be neither shortage nor surplus. As a result, one may conclude that in a real-world market the existence of unsold items must indicate a problem with the way prices adjust. Actually, in a market with less than perfect information, sellers are often left with unsold items and do not consider that any problem exists. In goods markets these unsold items take the form of inventory, and are the way sellers protect themselves from random changes in day-to-day and week-to-week sales. With perfect information of exactly when each sale would take place, sellers would be able to substantially cut inventories.

The lack of perfect information is the major reason that economists consider full employment to be some number greater than zero unemployment. **Frictional** unemployment results from the day-to-day changes in a dynamic, changing economic system in which old industries die and new ones are born, in which people get tired of old jobs and old bosses, in which bosses find work of subordinates unsatisfactory, and in which new people enter and others reenter the labor force. But before we discuss this type of unemployment, let us turn to the minor reason that full employment is less than zero unemployment, the problem of **structural** unemployment.

Structural unemployment exists when a person is not qualified for any job. This means that the amount he can contribute to any job (his marginal revenue product) is less than the minimum wage payable for that job. The minimum wage can be set legally, or else it can result from union negotiations or from the force of public opinion. It is possible that there would be structural unemployment even if the minimum wage was zero. There are some people, such as psychotics, whose presence on the job might so upset others that the amount of work done could drop. There are others, such as the profoundly mentally retarded, who might require more value spent in supervision than they can produce.

Many of the structurally unemployed will not show up in the unemployment statistics because after a time these people should become convinced that they cannot find a job and stop trying. The existence of this type of unemployment is considered a problem, and government programs have attempted to deal with it. For example, the Job Corp program of the 1960s and the CETA program of the 1970s were attempts to give the unskilled some skills and thus make them employable. On the other hand, legislation which establishes a legal minimum wage contributes to the pool of structurally unemployed labor.

Frictional unemployment is that unemployment caused by information or **search** costs. Usually when a person quits, is fired, or enters the labor market, there are jobs available for which that person is qualified. The person will be frictionally unemployed because it takes time (and effort) to find the jobs which are available.

The division between frictionally and structurally unemployed labor can shift with time. Since the demand for labor (its marginal revenue product) depends on the general demand for goods and services, an increase in the demand for goods and services will increase the value of labor services, and some who were previously structurally unemployed become "employable." Also, it is possible that some people may have such high search costs that even if there are jobs for which they are qualified, finding them may be so expensive that these people may be more properly considered structurally rather than frictionally unemployed. Hence, the

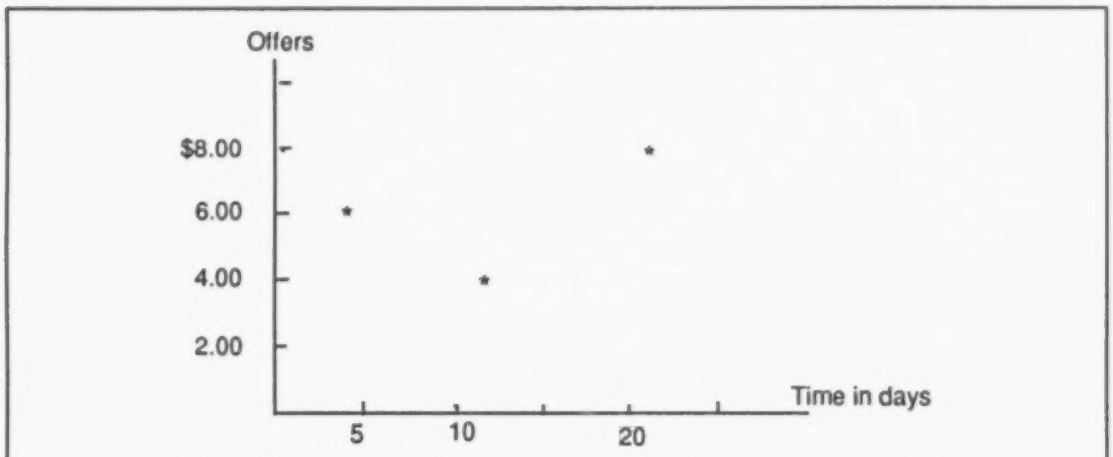


Figure 13.3 Offers are discovered with search time.

division not only shifts, but is a bit fuzzy as well.

Let us now turn to frictional unemployment and find out why economists seem unconcerned with "reasonable" levels of unemployment. At the base of this unconcern is the assumption that information is not free but can only be obtained with time and effort. In Figure 3, which shows search time on the horizontal axis and wage offers on the vertical, a person finds a job offer of $6.00 on the fourth day of search, another offer of $4.00 on the 12th day, and a third offer of $8.00 on the 21st day. In a world of perfect information all three offers would be known at time zero so no search would be necessary. The job applicant would simply pick the job that paid the most. When information is not free, deciding which job to pick is more difficult, and we turn to two models for help. The first of these models is a simplified way of describing actual behavior, and the second is useful as a way of seeing optimal behavior.

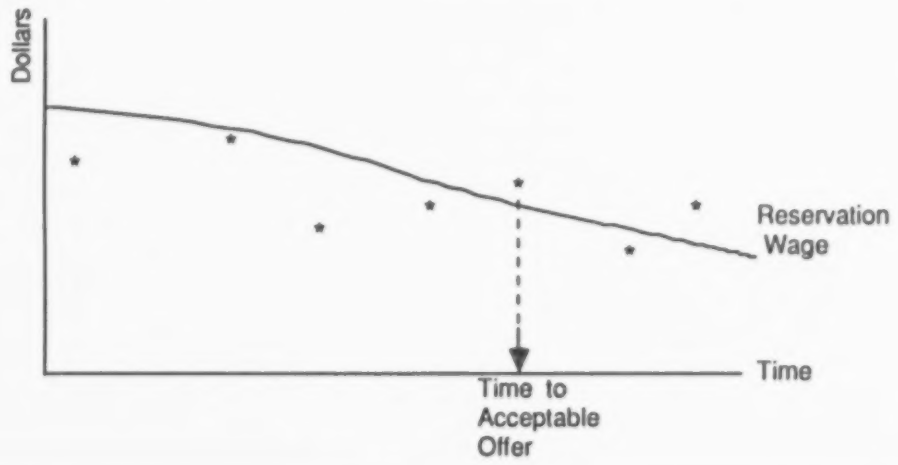
The first model uses these four assumptions: (a) the searcher has a minimum price (aspiration level or reservation price) which he will accept; (b) the prices offered follow a fixed but *unknown* probability function; (c) when an offer is made, it must either be accepted or rejected; and (d) the costs of searching and the the wages sacrificed by continued search (that is, the searcher could earn money if he accepted a job offer and stopped searching) make the minimum acceptable price decline with time. This model is illustrated in Figure 4.

Because the searcher does not know the market, he may initially set his aspiration level high to protect himself from taking too poor an offer. With time he reduces this level because of assumption (d) (and also because he knows the market better). Eventually he meets an offer above his aspiration level, and a sale is made.

Thus a person who has been receiving $15.00 per hour and who has been laid off or quit usually sets out to find another job with similar pay and difficulty. If he finds one quickly, he takes it. But if he finds instead a quick offer of a job paying $10.00, he may reject the offer in hopes of finding something better. Only after he has searched for some time without finding a job for $15.00 will he decide that it is unlikely he will find what he wants and will accept the $10.00 job.

The process described in Figure 4 is a good description of how people actually behave, but it does not tell us that there is an optimal or best amount of search time. The idea that there is some *optimal* amount of search time (which means there is an optimal

Figure 13.4 When offers are too low, search continues.



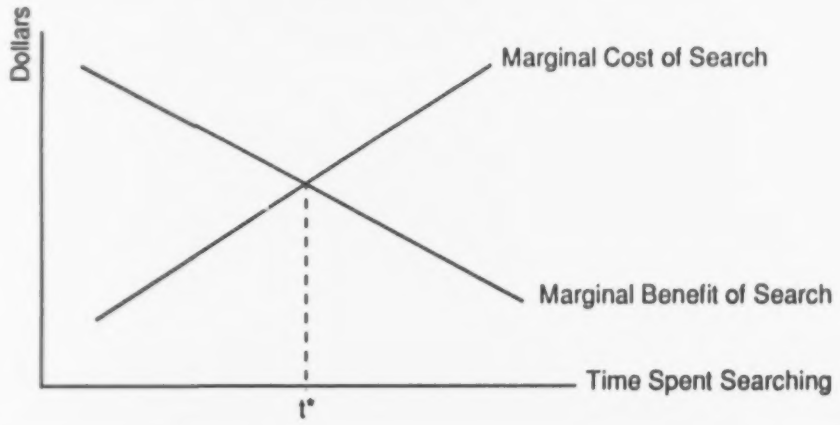
amount of unemployment) follows directly from the costs and benefits of search, and is an application of the maximization principle on which much microeconomic theory is based. It is a more abstract way of looking at search than our first model.

Suppose Jane Doe enters the labor force with limited knowledge of what jobs are available. She begins to search for offers. After some time and effort, she finds a job offer. Should Jane take the job she has found? It all depends on the costs and benefits of searching further. If the costs of additional search are greater than the benefits, she should take the job she has found. If the benefits of additional search are greater than the costs, she should reject the job and continue searching. Unfortunately Jane cannot be sure what the benefits of additional search will be, and her guess may be quite wrong. If she continues to search, she has guessed that extra benefits outweigh the costs. If she takes the job, she has guessed that the extra costs outweigh the extra benefits.

What are the benefits and costs of additional search? The main extra cost is foregone wages of not taking the job that was offered. Thus if one has found a job opening paying $350.00 per week, and one rejects it to search for another four weeks, the cost of the search is $1400.00 plus any additional costs—telephone bills, gasoline, mailing costs—associated with trying to find job openings. Extra benefits exist only if one can find a job opening that pays more than the best existing offer. (We are ignoring non-monetary aspects of jobs which can be as important as wages, aspects such as the pleasantness of the job, its status, and the people one must work for and with.) Thus after an extra month of search, one might find a job paying $360.00 a week. One must compute the extra benefit of this ten dollars a week with the aid of present value tables to learn if the extra month of search was worthwhile.

Figure 5 illustrates the ideas in this second model. There are costs of additional search, which increase with time because as time goes on one should find higher and higher offers. The cost of extra search is the wages one could have if one took the highest wage offered. The benefits of extra search should diminish because after some search it becomes harder and harder to find better offers. The optimum level of search occurs at the intersection of the marginal cost and

Figure 13.5 Optimal duration of unemployment occurs when the marginal cost of search equals the marginal benefit of search.



marginal benefit curve.

Figure 5 implies that there is an *optimum* amount of time to remain unemployed. If this sounds strange, it is probably because you are comparing the world to an ideal with perfect information. In a world of perfect information, the optimum search time would be zero. But in the real world in which information must be acquired through time and effort, searching for employment is a *productive* activity, not a waste. Search produces information so that better decisions can be made. It is this realization which has made economists relatively unconcerned with "reasonable" levels of unemployment (though many would like to find ways to make information easier to obtain and thus make search both more productive and shorter). Note, however, that Figure 5 implies only that there is an optimum search time, and not that any searcher will know what it is.

THE PHILLIPS CURVE

The theories of job search in the previous section were developed in large part to understand the **Phillips curve**. The Phillips curve was based on a 1958 article by A.W. Phillips in which he noted that there was a relationship between unemployment rates and changes in wage rates in the United Kingdom. Economists saw his results as a missing piece to the income-expenditure model, and after a slight alteration (changing the wage rates to prices), his curve became one of the most famous curves in economics.

Figure 6 shows the combinations of unemployment and inflation which the United States experienced in the 1950s and 1960s. Each point represents one year and tells that rate of inflation and unemployment for that year. For example, in 1953 the rate of inflation 1.6% and the rate of unemployment was 2.9%. This year is represented by one of the two points off the line closest to the origin. Notice how the points tend to cluster around a downward-sloping curve. This curve is the Phillips curve.

The Phillips curve became important when economists began to interpret it as a curve which showed the range of possibilities open to the economy. This interpretation was perhaps natural given the tendency for economists to think in terms of trade-offs. Economists believe that free lunches are very rare; that to get something desirable, one almost always must give up something. The Phillips curve can be interpreted as a trade-off: to get reduced unemployment, the economy must

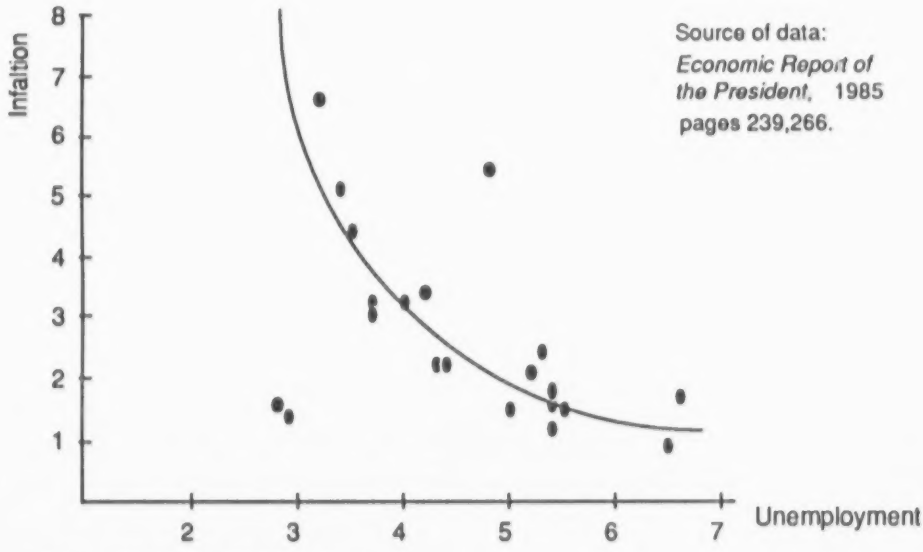


Figure 13.6 The Phillip's Curve

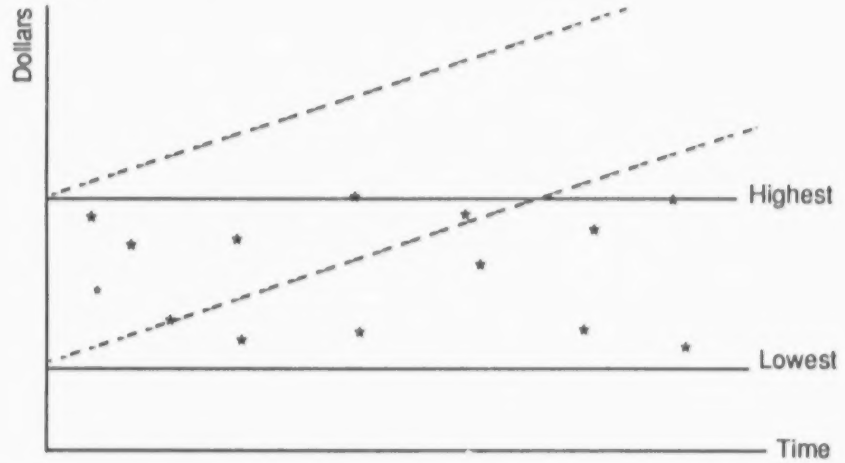
suffer from more inflation, and to get reduced inflation, the economy must suffer from more unemployment.

The Phillips curve completed the income-expenditure model. We have noted that the income-expenditure model is in terms of real or constant-price values. It does not claim to explain prices. However the Phillips curve opened a way for it to add the rate of inflation as a variable it could predict. The model would explain real output, and each level of real output could be associated with an unemployment rate. Then with the Phillips curve each level of unemployment could be associated with a rate of inflation. The major problem for policy makers then became one of trying to balance the benefits of more employment against the costs of higher inflation. Once they had decided which point on the Phillips curve was best, they believed that they could use fiscal and monetary policy to attain it. Many economists had enough faith in their understanding of how the economy worked that they began to talk about abolishing recessions forever and of "fine tuning" the economy.

The addition of the Phillips curve changed the aggregate supply and aggregate demand curves implied in the income expenditure model. The model no longer had to assume the horizontal aggregate supply curve in Figure 12.8. It now had an upward-sloping supply curve (but with rates of inflation, not price level, on the vertical axis). One can get from the Phillips curve to an upward sloping curve by putting employment rate rather than unemployment rate on the axis. Though the aggregate demand curve remained vertical, the resulting model was a far more attractive theory than one which could say nothing about inflation, a key variable of macroeconomics.

Economic results in the 1960s seemed to confirm the interpretation of the Phillips curve as a long-run and stable trade-off. As the decade passed, the U.S. economy got lower and lower unemployment rates and higher and higher rates of inflation. The idea of the unemployment-inflation trade-off became part of the conventional wisdom, and

Figure 13.7 Unexpected changes in price level will fool people into searching the wrong amount of time.



even began appearing in principles textbooks.

Thus economists were a bit surprised when Edmund Phelps and Milton Friedman published articles in 1967 and 1968, respectively, arguing that there was no trade-off in the long run, and the whole Phillips curve was based on fooling people. Econometricians took the data to their computers to resolve the issue, but their cleverness had little effect on the debate. Instead it was the numbers which the world threw out in the next decade which convinced even the most skeptical that the original interpretation of the Phillips curve was mistaken. Question 5 at the end of the chapter gives you the data of the 1970s, and you can graph them to see how the nice world of the Phillips-curve trade-off fell apart for economists.

The explanation of why the Phillips curve is not a stable trade-off can be built on a theory of search. Consider the story told in Figure 4, and assume that the distribution of offers is stationary. Figure 7 illustrates a stationary distribution of offers. All offers that a person will get are contained between the lines "highest" and "lowest." With this distribution and a path for the reservation wage, there will be some average amount of time spent in search and thus as unemployed.

Now suppose that instead of being stable, the distribution of offers gradually rises, or is between the dotted lines in Figure 7. If a searcher is unaware that the distribution has tilted upward, he will have no reason to change the path of his reservation wage. With a fixed path for the reservation wage, the searcher will, on the average, find an acceptable offer more quickly. Thus, there will be less unemployment with a rising distribution of offers than there will be with a stationary distribution. On the other hand, if the distribution is falling, then with a given path for the reservation wage, unemployment should be higher than with a stationary distribution.

The above paragraph gives a story which will generate a Phillips curve. The faster wages rise, the more quickly a searcher will find an acceptable offer, and the lower will be unemployment. However, the story assumes that the searcher is unaware that the distribution of offers has tilted. Suppose instead that we assume that he does become aware. Then it is reasonable to assume that he will try to compensate for the tilt by adjusting his reservation wage. If he expects wages to be

rising by 10% a year, he will not let the path of his reservation wage drop as rapidly as he would if he expects no inflation. At some rate of expected inflation, he will not let the reservation wage drop at all, but will let it climb.

Once one lets the path of the reservation wage be determined in part by expected inflation (of wages or prices), one undermines the Phillips curve as a long-run trade-off. There will be a trade-off, but it depends on expectations of inflation remaining constant. Once expectations change, the old Phillips curve will shift. This seems to be what happened in the 1970s. Late in the 1960s or early in the 1970s expectations of inflation changed, and so did search behavior. As inflation continued to rise, people began to expect higher and higher rates of inflation. As the short-run Phillips curve shifted upward, positions of high unemployment became compatible with high rates of inflation. As the belief that there was a stable trade-off between unemployment and inflation crumbled, so did the belief that government stabilization policy could solve all its problems. But that is a story for a later chapter.

THE AGGREGATED MARKETS IN RETROSPECT

In Chapter 7 we saw that economists usually combine the millions of markets in a modern economy into the four aggregated markets of goods and services, money balances, resources, and financial assets. They then ask two questions about each market: could it be a source of the instability which we observe as inflation and recession, and if the market is thrown out of equilibrium, how quickly will it readjust? We have now looked at each of these aggregated markets. Table 1 summarizes our conclusions.

Few economists point to either the financial markets or the resource markets as sources of inflations or recessions. The resource market, however, is important because parts of it seem to adjust slowly when prices must fall to restore equilibrium. If part of a system adjusts slowly, the entire system must adjust slowly. The financial markets seem to adjust rapidly, and their role, in the view of most economists, is to transmit disturbances from one set of markets to other sets.

There is disagreement among economists

TABLE 1
SUMMARY OF FINDINGS ABOUT AGGREGATED MARKETS

Market:	Source of Disturbance?	Speed of Adjustment
Goods and Services	yes, stressed by Keynesians	a bit slow
Money Balances	yes, stressed by monetarists	very fast
Financial	Probably only rarely	very fast
Resource	Probably only rarely	very slow

about how important the disturbances which originate in the market for money balances are relative to those which originate in the markets for goods and services. This disagreement took the form of a well-publicized debate between the monetarists and Keynesians in the 1960s and 1970s. Though the debate still goes on, both the debate and events since the start of the debate have brought the sides closer together. Virtually all economists, for example, recognize that some disturbances come from the market for money balances—in this sense, virtually all economists today are monetarists.

While most economists believe that the market for money balances adjusts quickly, many economists are not so sure that the same holds true for the markets for some goods and services. Many economists argue that there are adjustment problems in these markets as well as in the resource markets. If markets are not competitive, or if prices are controlled by the government, or if there are significant costs to changing prices, prices may not adjust rapidly. However, most economists believe that some of the "stickiness" of prices in goods and services reflects "stickiness" of prices in the labor market.

SUMMARY

Beginning in the 1960s economists began to realize that many conditions which they had considered problems in the labor market (and in other markets as well) could be explained in terms of the difficulty of acquiring and using information. This chapter identified some of those problems which have important macroeconomic consequences.

The potential for abuse arising from asymmetrical information—management has better information about economic conditions affecting the firm than do workers—leads workers to distrust any suggestion for wage reductions. Instead workers allow management control over hours because management cannot get hidden benefits from actions which harm workers. In a world of perfect information, wage cuts should largely replace reductions in hours.

Related to the problem of wage stickiness is the problem of screening, or identifying workers of higher skill and ability from those of lower skill and ability. Since screening takes time and effort, the workers a firm has represent an investment to the firm which it will lose if it discharges them or they leave. As a result, the employer will be reluctant to discharge existing workers and to replace them with new workers willing to accept lower wages, even if the legal system does not penalize such an action. In fact an employer which does not want to lose key employees may keep these employees on the payroll even when no work exists for them to do. In a market in which items are homogeneous—of identical quality—such problems would not exist. When an item is heterogeneous—each item is different from all similar items—more time and effort is required to obtain information before transactions take place.

The theory of search, which explains why the labor market will not clear with zero unemployment, also depends on information having a cost. A searcher does not know where offers are; he must find them with time and effort. There is no need for search in markets with costless information.

A theory of search yields a Phillips curve. When wages are rising faster than people expect, they spend less time searching and unemployment drops. When wages are worse than they expect, they spend more time searching and unemployment rises. But if one assumes that people's expectations change as their experiences change, one has little reason to believe that there is a long-run trade-off between unemployment and inflation. The Phillips curve exists because people base their actions on "stale" information.

It is instructive to compare the labor market with financial markets. Financial markets usually adjust quickly and perform much as markets in a world of perfect information are supposed to. Information is cheap in these markets. As a result, the major role assigned them in macroeconomic theory is as a transmitter of disturbances from one sector to another. Labor markets (and other

resource markets) are not assigned a role as a transmitter. Rather they are seen as largely determining how fast or slowly prices rather than quantities react to a change in total spending.

QUESTIONS

1. How would the existence of unemployment insurance affect the optimal search time in Figure 5?

2. The theory of search applies not just to the labor market, but many other markets as well. Answer the following by identifying the costs and benefits of search.

a. Suppose you are moving to another city and must sell your house. Will you take the first offer you receive? How will you decide when to stop rejecting offers and accept one?

b. When you searched for a college, how many colleges did you investigate? Why did you not investigate one more?

c. When a person buys a new car, he generally visits several car dealers to compare prices and products. A person searching for a new toothbrush rarely visits more than one "toothbrush dealer." Why do people spend a lot of time searching for a new car but so little for a new toothbrush?

d. Suppose a person has had his car wrecked. Would you expect him to search more, less, or the same as a person who wants to buy a new car because his present car is getting old?

e. People search for marriage partners in the "marriage market." (Marriage is a contract.) Will people spend more time searching when divorce laws allow quick and easy divorces, or when no divorce is allowed?

3. In 1975 oil exporting countries curtailed output and raised prices. Economists were unsure about how to treat this event. (a) Some said that it was similar to an increase in taxes. Both imports and taxes are withdrawals from the stream of spending. If one treats this event as similar to taxes, one will get a prediction of the end results from a simple income-expenditure model. What will this model predict about what will happen to unemployment and prices?

(b) Most economists now believe that this is a case of a disturbance which originated in the resource markets. Show how this event can be represented in terms of Figure 2 of Chapter 9. What will the long-run effects be on price level and output? Speculate on what reasonable short-run effects will be.

4. According to the marginal productivity theory of wages, wages in competitive markets depend on three forces: productivity, the demand for the product, and the supply of labor. Try to decide which of these factors are responsible for the following:

a. The International Lady Garment Workers runs buy American ads as a way of increasing the earnings of their members.

b. College professors teach pretty much as they did 50 years ago, yet are paid vastly more than they made then.

c. In order to become a barber in some states, people must attend a year of school. Barbers tend to earn more in such states than in states with fewer entry restrictions.

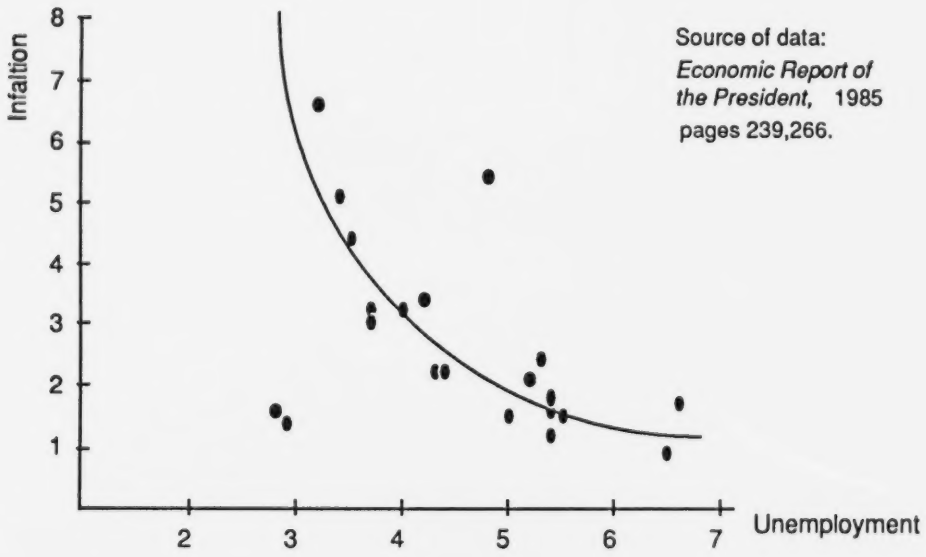
d. Some lawyers earn much more than others who have the same specialties, education, and years of experience.

e. Many sorts of construction work is risky in the sense that the work is not steady and periods of unemployment are common. These sorts of jobs often pay higher wages than similar work which is more stable.

f. Unskilled labor in a Chinese factory is paid much less than unskilled labor in an American factory. Yet the average production per man hour may be little different.

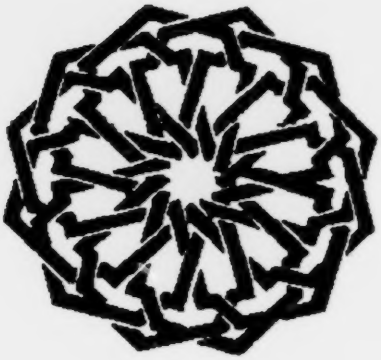
5. Below are data on unemployment and inflation for the years 1971 to 1984. Graph them on the Phillips curve below. When would you decide that there was something seriously wrong with the relationship if you had been watching the numbers appear as the economists of the time did?

Year	Inflation	Unemployment
1971	5.0%	5.8%
1972	4.2	5.5
1973	5.8	4.8
1974	8.8	5.5
1975	9.3	8.3
1976	5.2	7.6
1977	5.8	6.9
1978	7.4	6.0
1979	8.6	5.8
1980	9.2	7.0
1981	9.6	7.5
1982	6.0	9.5
1983	3.8	9.5
1984	3.7	7.4



Source of data:
Economic Report of the President, 1985 pages 239,266.

6. We usually think that more output is automatically better. Explain how a country can have too much output, or too high a GNP. (Hint: What happens to the amount of labor time needed as output goes up? What are the extra benefits of more output, and what are the extra costs? Can you formulate your answer in terms similar to that used in Figure 5?)



CHAPTER 14

LOOKING FOR SYNTHESIS

After you finish this chapter and work the questions at the end, you should be able to:

Explain what changes one must make to the income-expenditure model for it to includce effective monetary policy.

Explain what changes one must make to the quantity theory for it to include effective fiscal policy.

Explain what effects fiscal and monetary policy will have in the ISLM model.

Explain why monetarists argue that fiscal policy can be crowded out.

Explain why ISLM is troubled by the distinction between real and nominal interest rates.

Define money illusion.

Explain how one can get an aggregate demand curve from ISLM, and how the aggregate supply curve depends on how prices are set.

The past several chapters have introduced two types of actions which the government can use to influence inflation or unemployment. Monetary policy, which the central bank controls, was explained using the quantity theory of money. Fiscal policy, the use of government spending or taxes to change total spending, was explained by the income-expenditure model. You should have noticed that these two models presented very different views of the world. The income-expenditure model, for example, had no role for monetary policy, nor did the quantity theory have a role for fiscal policy.

The chapter shows one way to bridge the very large gap between the income-expenditure model and the quantity theory. A key in bringing these two viewpoints closer together is the interest rate. By introducing the interest rate into these models, one can show that fiscal policy might work in a quantity-theory view, and monetary policy might work in an income-expenditure view. In addition, the addition of the interest rate allows us to build a compromise model called the ISLM model. It was developed by John Hicks a year after Keynes published the *General Theory*. One of the attractions of the ISLM model is its ability to present macroeconomics in terms of a model with exactly the same structure and mechanics as the model of supply and demand.

This chapter explains the logic and workings of the ISLM model. It will point out some of the conclusions and insights which can be deduced from the model, and also some of the weaknesses of the model. It concludes by looking at how the alternative synthesis of aggregate demand and aggregate supply meshes with ISLM.

THE IS CURVE

In the simple income-expenditure model of Chapter 12, investment was taken as fixed. There was no explanation for what determined investment. However, investment decisions are not arbitrary, but are determined by businessmen calculating the costs and benefits of additions to their capital stock and inventories, and by consumers calculating the costs and benefits of purchasing houses. Thus the model will be a better model if it can incorporate reasons for investment rather than leaving it outside the model.

Though the calculations determining the amounts of various categories of investment are each a bit different, all involve the interest rate. This chapter will consider only the sort of calculation behind the decision to purchase new machinery, and will leave the decisions about inventory and housing to more advanced courses.

When a business decides whether or not to invest in new equipment, it estimates as best it can the future returns that will flow from the new equipment. Then it must compare these benefits to the costs of the investment. Suppose, for example, that a business can buy a new machine and it believes that this machine will add output worth $20,000 each year for five years. One might assume that the firm would decide to buy the machine if it costs less than $100,000. If the machine costs $95,000, for example, the firm could make a profit of $5000. However, this conclusion is wrong because it ignores the interest rate and the concept of present value.

If the firm must borrow the $95,000 in the above example and the interest rate is 10%, the machine would never earn enough to pay both the original cost and the interest on that cost. One could use the first year's returns of $20,000 to pay off part of the debt, but in the first year the amount owed would have grown by 10% or $9500. Thus after one year the business would owe $95,000-$20,000+9500 = $84,500. Continuing with future years, one sees that the business will lose money by purchasing the machine.

One might at this point argue that the conclusion would be different if the firm financed the machine from retained earnings. The argument is wrong. The firm has a choice of investing its $95,000 either in the machine or in a financial asset which will earn interest. Unless the firm is run by fools (in which case its future is not bright), it will

TABLE 1
THE INCOME-EXPENDITURE MODEL WHEN INVESTMENT DEPENDS ON THE INTEREST RATE

IF EXPECTED INCOME IS:	PEOPLE WILL; PAY TAXES	SPEND:	SAVE	GOVERNMENT SPENDS:	INVESTMENT 5%:	INVESTMENT 4%:
500	20	450	30	20	45	60
600	20	530	50	20	50	65
700	20	610	70	20	55	70
800	20	690	90	20	60	75

use its funds where returns are highest.

In determining how much to invest, the firm must consider both the cost of the machinery and the cost of financing the investment. This latter cost depends on the interest rate. It also considers the potential returns on the investment, which depends on expected future spending in the economy. Thus in 1933, when there was massive unemployment of men and machines, there were few investment purchases which could have offered much of a return in future years. Even if the cost of financing new investment had been close to zero (it was not for most businesses, though it was for the government—interest rates that a borrower faces depend on how risky he seems to the lender), it would have made no sense for most businesses to add equipment. They already had plenty idle, and it served no purpose to build more to sit idle.

One could also argue that interest rates should affect consumption. Changes in interest rates affect the benefits from saving and the cost of borrowing. They also affect the value of financial wealth, and wealth should affect consumption. A rise in the interest rate causes the value of existing bonds to fall and a fall in the interest rate causes the value of existing bonds to rise. However, in the interests of simplicity, we will assume that consumption is unaffected by changes in interest rates.

The modification that the above discussion makes to the simple income-expenditure model is illustrated in Table 1. In this table there are two columns which show investment. One column shows what investment will be at each level of income if the interest rate is 5%, while the other shows what investment will be if the interest rate is 4%. If the interest rate is 5%, equilibrium income is 600. If the interest rate drops to 4%, equilibrium income will rise to 700. Similarly, different levels of investment would exist for all other levels of interest rates, and for each interest rate, there would be an equilibrium level of income. We expect that lower interest rates would spur investment, and thus be associated with higher levels of

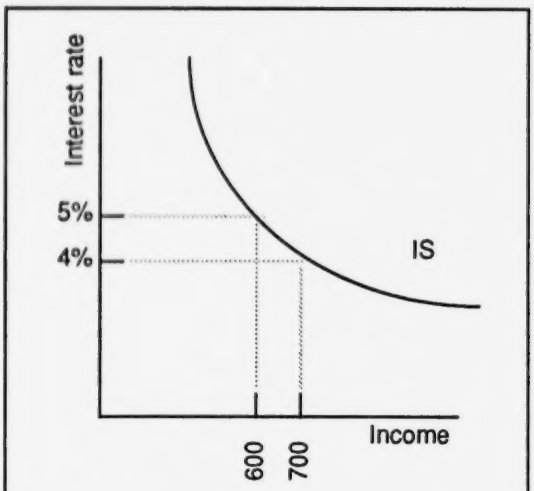


Figure 14.1 The IS curve slopes downward

equilibrium income.

Figure 1 shows what this idea looks like when we represent it on a graph. The curve is known as the **IS curve**. It shows qhat equilibrium income is for each level of interest rate. The name comes from the condition for equilibrium when there is no government in the model, that investment (*I*) must equal savings (*S*).

The addition of the interest rate to the income-expenditure model opens a way for monetary policy to influence spending within the logic of this model. When the central bank allows the banking system to create more money, banks increase their lending. This additional supply of funds reduces interest rates. Lower interest rates increase investment, which has a multiplier effect on total spending. A contraction of money will have opposite results.

THE LM CURVE

The **LM curve**, named because it shows positions at which the demand for money (*L* for liquidity preference) equals money supply (*M*), completes the model. In the quantity theory of money we have already met a model of the market for money balances. The quantity theory asserted that velocity was constant, or

(1) MV = Y

which can be rewritten as:

(2) M= (1/V)Y = kY.

Equation 2 says that the amount of money which people hold is a fraction of income. This equation is always true; k will take whatever value needed to make it true. In England in the early 19th century, this equation was altered and made into a demand-for-money equation. The average amount of money people *want* to hold depends on the amount of spending they *expect* to do. Thus people who expect to spend a great deal will, on the average, want to hold larger cash balances than those who expect to spend only a little. The "on the average" in the last sentence is important. If a person holds $1400 on Monday and nothing the rest of the week, he has an average weekly holding of $200.

Making these alterations in equation 2 gives:

(3) Money demand = k(expected income)

The k in this equation should not move much or else the equation does not tell us much about how people act. This equation, unlike equation 2, does not need to be true.

The writings of John Maynard Keynes made economists reconsider the traditional demand-for-money function. Keynes argued that there were three reasons why people hold money. They hold cash for transactions purposes, which is what the quantity theory had always said. They also hold money for precautionary reasons, so that in an emergency they would have a ready source of funds. Finally, they hold money for speculative purposes. The speculative motive arose from the effects of interest rates on the price of bonds. When interest rates rise, the price of bonds falls. (See Chapter 8.) Thus when people think interest rates are unusually low, they would prefer to hold their assets in the form of money. If they invested in bonds and the interest rate rose, they would suffer a loss. Hence the amount of money people would want to hold should be inversely related to the rate of interest. People will want to hold more money (liquidity) when interest rates are low than when they are higher.

Keynes' introduction of the interest rate into the demand for money has survived, but not for the reasons he gave. Keynes was thinking in terms of a two-asset world: money which earned no interest but which was liquid and had no danger of a capital loss, and bonds, which earned interest but which were not as liquid and which could yield a capital loss. If one thinks not in terms of a two-asset world, but in terms of the range of assets which actually exist in the world, there is no reason to hold cash balances for either precautionary or speculative purposes. There are assets which are both very liquid and which earn interest, such as savings

accounts and Treasury bills, and these are a better form in which to hold assets for these purposes.

Interest rates are still included in the demand for money because interest rates should be a factor which determines the size of transactions balances. Money held for transactions purposes is much like inventory which businesses hold. Businesses do not want to hold very large inventories because this ties up funds on which they could be earning interest (or uses funds which are borrowed and on which they must pay interest). Thus if a firm can sell $100,000 of its inventory, it has $100,000 in cash which it can invest and on which it will earn interest (or it can pay off $100,000 of debt on which it must pay interest). The cost of inventories rises as interest rates increase and as the size of inventories increase.

However, there are also costs to holding inventories which are too low. If inventories are too small, a business may run out of items and lose sales. Further, if inventories are held at low levels, the business will need to reorder often, and there are usually costs to reordering. Thus the business must balance these costs which rise as inventories increase with the other costs which fall as inventories increase. The problem can be solved elegantly using calculus, but you should be able to see intuitively that a rise in interest rates will decrease the optimal size of inventories, and a rise in the cost or reordering will increase the optimal size.

When people hold cash balances, they hold their assets in a form that earns either no interest (coin and currency and some deposits on which checks can be written) or less interest than is possible in accounts on which no checks can be written. (Between 1933 and the early 1970s U.S. law prohibited interest payments on any account on which checks could be drawn. With the advent of checking accounts which earn interest, the importance of interest rates in determining the size of cash balances may diminish, though it still should be important in determining in what form—currency or checking account—money is held.)

If interest rates rise on non-money assets relative to money, the cost of holding money in terms of interest foregone rises, and one would expect people to try to economize on cash. A business, for example, could shift money from checking accounts into t-bills. It would be worthwhile to make more transactions into and out of interest-bearing assets to take advantage of the higher interest rates. When interest rates are very low, these transactions may not be worthwhile, and the business may be willing to let money lie idle for short periods in checking accounts.

These considerations lead us to a revised demand for money function. Instead of equation 3, the demand for money should be:

(4) $Md = kYe + wi$.

The demand for money, or the average amount of money people want to hold, depends positively on expected transactions and negatively on the interest rate. w should be a negative number because with higher interest rates people should want to hold smaller cash balances.

To complete this part of the model, we need a money-supply equation and an equilibrium condition. A simple money-supply equation is that money stock is fixed and determined outside the system by policy. The logical equilibrium condition is that the market for money balances is in equilibrium when money supply equals money demand.

To see how this part of the model functions, imagine that interest rates are very low. When interest rates are very low, people have no special reason to avoid holding idle cash, and will hold considerable amounts. If they hold lots of cash idle, the fixed amount of money cannot support very much spending. Lots of idle cash means that the representative dollar is not being spent very frequently.

On the other hand, if interest rates are very high, holding idle cash is costly, and people will try to keep their holdings low. This means that they will spend money rapidly, or that the velocity of money will be high. With higher interest rates the same fixed quantity of money will support more spending than it

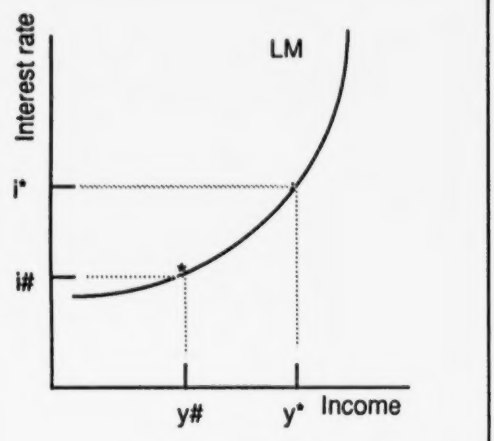


Figure 14.2 The LM curve slopes upward.

did when interest rates were low and people were holding idle cash balances.

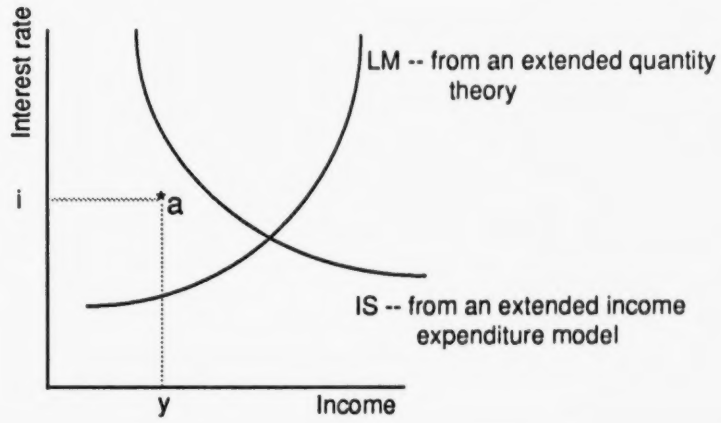
Figure 2 illustrates the relationship discussed in the last two paragraphs. The curve tells how much spending some fixed amount of money will support. When interest rates are high, as at i*, money is spent rapidly and supports a lot of spending, y*. When interest rates are low, at i#, the money stock supports less spending or y#. Connecting these two points to represent what happens at other interest rates generates the LM curve.

The addition of interest rates to the quantity theory allows fiscal policy to have effects within the logic of the quantity theory. If, for example, the government reduces taxes, thereby raising its deficit, it must borrow more. This added borrowing increases the demand for loanable funds and the price of these funds, which is the interest rate, should rise. The higher interest rate makes holding idle funds more expensive, and should result in an increased velocity of money.

COMBINING IS AND LM CURVES

Having found the IS and LM curves, we now do the expected: we place them together on the same graph. Figure 3 is the result. Only at the intersection of the two curves are both the goods market and the money market in equilibrium. At any other point at least one of the markets is out of equilibrium. Consider point *a* in Figure 3. At point *a* the

Figure 14.3 ISLM is macroeconomics which looks like supply and demand.



interest rate is higher and expected income is lower than the equilibrium levels. With the higher interest rates people want to hold less money than they do at the equilibrium level of interest, and at the lower expected income they also want to hold less money than they do at the higher equilibrium income. Thus there will be an excess supply of money. There is more money in circulation than people want to hold. As a result, people will try to get rid of surplus funds, or in the jargon of economists, they will try to adjust their portfolios. They can spend the money, or they can buy financial assets which will drive down interest rates and increase spending.

Now consider what is happening in the goods market at point *a*. At interest rate i people will spend more than they expect to receive and thus actual income will be greater than expected income. For income of Y to be equilibrium income, interest rates must be higher. Because actual spending will exceed expected spending, expected income should rise and the economy should move toward the IS curve. Some books call this situation a case of excess demand in the goods market. This case is more clear when the income-expenditure model is constructed in terms of actual income and planned expenditures. Then at point a planned expenditures will exceed actual output and inventories will be decreasing.

The similarity between ISLM and supply and demand should be obvious. The curves look the same. Further, just as IS and LM can be interpreted as lines of partial equilibrium, so can supply and demand curves. The demand curve shows all the price-quantity points at which buyers are in equilibrium, and the supply curve shows all the price-quantity points at which sellers are in equilibrium. Market equilibrium exists when both buyers and sellers are in equilibrium, which only happens where the curves intersect. There is still a further similarity. One can show by shifting the curves how changes in factors held constant will affect the equilibrium levels of the variables on the axis.

Examining the way the ISLM model is constructed reveals that a change in fiscal policy alters only equations that are used to build the IS curve, and changes in monetary policy alters only equations used to build the LM curve. An expansionary fiscal policy will shift the IS curve to the right, increasing interest rates and income. An expansionary monetary policy will shift the LM curve to the right, increasing income but decreasing interest rates. The way in which one shifts these curves is exactly the same as how one shifts curves in the model of supply and demand. (See question 2 at the end of the chapter.)

ISLM reveals that financing can matter. Recall that it did not in the simple income-expenditure model. That model assumed that financial markets imposed no limitations on the goods markets. The differences in these models can be seen in Figure 4. Here we have an increase in government spending, which shifts the IS curve to the right. The simple income expenditure model, in which there are no interest rates, would predict that income would increase from Y1 to Y3. In the ISLM model the shift in the IS curve increases the interest rate, and this increase **crowds out** some investment, at least par-

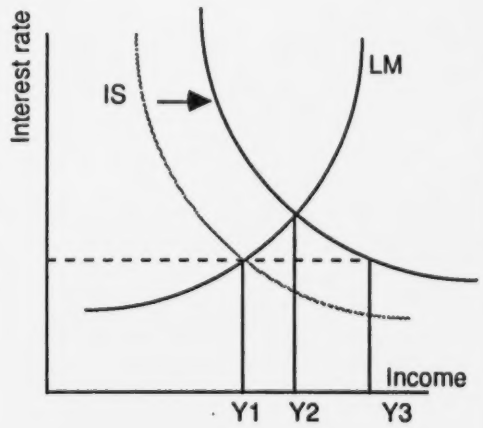


Figure 14.4 A shift in the IS curve changes equilibrium output and interest rate.

tially offsetting the effects of increased government spending. The steeper the LM curve, the greater the crowding out that this model suggests.

Suppose this same increase in government spending were financed not by borrowing from the public, but by printing more money. In this case both the IS and LM curves would shift to the right. As a result, interest rates would not rise, investment would not be crowded out, and the increase in income would be much greater.

LIMITATIONS OF THE ISLM MODEL

Though the ISLM model is the fundamental model of macroeconomics, seldom do macroeconomists try to estimate the parameters of the model and use it to predict the future course of past behavior of GNP. There has been at least one attempt to estimate the importance of fiscal and monetary policy with equations similar to the equation one attains when one solves the model for equilibrium income. However, many economists have argued that such an approach could not capture the subtleties of how the economy works and thus do not give reliable estimates. (The study was done by economists at the Federal Reserve Bank of St. Louis and found that monetary policy was much more powerful than fiscal policy. It is interesting to speculate how positions on this study would have changed if the study had shown that fiscal policy was more powerful than monetary policy.)

The fact that economists have not used the ISLM model in their attempts to *numerically* predict the effects of policy suggests that ISLM has weaknesses. The first of these is the question of whether or not ISLM is meant as a long-run or short-run model. If it is meant as a long-run model, then its prediction that equilibrium can exist at any level of output is controversial. ISLM aggregates the economy into three markets: goods, money, and all other. This aggregation makes sense if nothing interesting happens in the "all-other" market, if it simply adjusts passively to changes in the goods and money market. Included in the passively adjusting sector is the resource market; the purpose of Chapter 13 is to explain why this market does not adjust smoothly.

ISLM predicts the equilibrium can be at any level because it assumes, as does the simple income-expenditure model, a passive supply. Sellers produce whatever is demanded, and all adjustment to changes in demand are in the form of changes in output. None of the adjustment is in the form of changes in prices. Adjustment cannot be in the form of price changes because the price level does not enter the model. Since changes in prices are a major problem in economics, the failure of ISLM to say anything about prices is a serious weakness.

If meant as a short-run model, the model is severely limited because it does not incorporate the rate of inflation. Inflation creates a difference between real and nominal interest rates. The nominal rate is the visible rate which people pay and receive, and the real interest rate is what is happening in terms of purchasing power. Thus if the rate of interest is 5% and the rate of inflation is 10%, a person who borrows $100 and pays back $105 in a year will pay back less in terms of purchasing power than he borrowed. He pays back 105 dollars, but each dollar can buy 10% less than it did a year earlier. Hence his rate of interest in real terms is actually negative. The real interest rate is computed as the nominal interest rate less the rate of inflation.

(Actually this equation is only approximate. The exact formula is:

real rate = (nominal rate - inflation)/(1 + inflation).

When the rate of inflation is low, the denominator can be ignored.)

The distinction between real and nominal interest rates is important in ISLM because investment spending should respond to the real interest rate and money demand to the nominal interest rate. To see why investment

depends on the real rate, consider a situation of zero inflation in which a person buys a machine that will cost $100 and earn $105 one year later. This purchase will be worthwhile if the interest rate is below 5%. Now suppose that inflation jumps from zero to 10%. The same machine will produce the same output, but because of the increase in prices, the output will be 10% more valuable in terms of the money it brings. Thus the $100 machine will earn $115.05 (which is 10% more than 105) in one year. The investment is now worthwhile at any nominal rate under 15% (which is a real rate under 5%.) Investment will remain constant if the real interest rate does not change; change in nominal rates will not change investment if they do not change the real rate.

To keep the demand for money constant (which means that the velocity of circulation remains constant), the nominal interest rate must remain constant. People hold cash balances for transactions; they hold **purchasing power**. If all prices double, the amount of money people want to hold will double, but the amount of purchasing power they want will remain constant. (It is important to realize that this last statement is discussing two situations of equilibrium, one with prices higher than the other. The rate of inflation is assumed to be the same in both situations. That people will hold constant amounts of purchasing power is the central tenant of the quantity theory of money.) The interest rate is a cost of holding purchasing power. If the rate of inflation increases, and the rate of interest with it, holding money becomes more expensive and people will want to hold smaller amounts of purchasing power. Thinking of the demand for money in terms of purchasing power lets us ignore price level and is the key to seeing the effects of the rate of interest. It is the nominal rate, not the real rate, that matters.

Further, the rate of inflation independently affects the demand for money by changing its desirability as a store of wealth. In cases of very serious inflation, such as the German hyperinflation of 1923, people try to spend money as quickly as possible because it is losing its value. As a result, the velocity of money increases. To some extent estimates of how sensitive money demand is to interest rates may be catching this sensitivity of money demand to inflation because rates of inflation and interest rates move together.

One could graph the ISLM model assuming that the vertical axis measured the real rate. Then any time the rate of inflation changed (and thus the nominal rate), one could shift the LM curve. A more rapid inflation would shift the LM curve to the right, for example, reducing real interest rates and increasing income. The problem with this solution, however, is that it leaves the rate of inflation as autonomous, unrelated to what is happening to fiscal and monetary policy. Though there have been times when many economists considered inflation autonomous ("cost-push" theories which were very popular in the 1950s are an example—prices rise because costs rise), most economists believe that macroeconomic policy is by far the most important determinant of rates of inflation.

Given these serious weaknesses, why has ISLM remained as a framework for so much macroeconomic thinking? A major reason is that no other simple model gives as much insight. ISLM suggests that economic disturbances can arise in either the money market or the goods market, a conclusion which predates ISLM. (Recall the overinvestment theories of the business cycle.) Economists want a simple model which concludes this. Also, ISLM can be expanded and made more complex in an effort to overcome its limitations. The next two chapters will examine some possible expansions.

AGGREGATE DEMAND AND AGGREGATE SUPPLY

ISLM aggregates the economy into a market for money balances, a market for goods and services, and a residual market which it

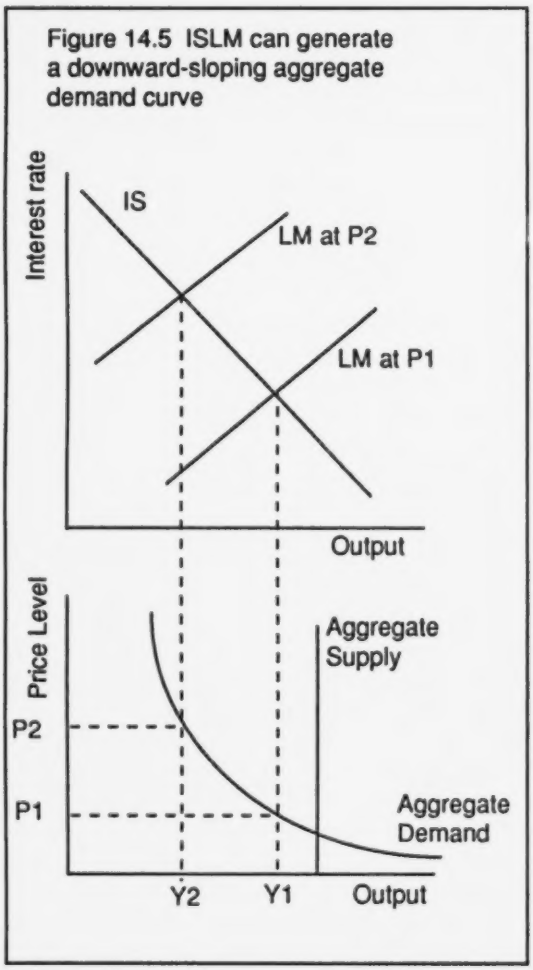


Figure 14.5 ISLM can generate a downward-sloping aggregate demand curve

ignores by invoking Walras' Law. Since part of the residual market is the labor market, and because adjustment in this market is slow, ISLM would be a better model if it could capture what is happening in the resource markets. Aggregate supply-aggregate demand analysis makes this incorporation.

The aggregate demand curve is derived from the ISLM model. Figure 5 illustrates the method. At price P1 equilibrium income is Y1. Let the price level rise to a higher level, from P1 to P2. At the higher level, with a *constant* amount of money, purchasing power is cut. The fixed number of dollars no longer buys as much. The effects on the LM curve are identical to what happens when prices remain fixed and the amount of money falls. The LM curve, in either case, shifts left, interest rates rise, and income falls. The output levels at both P1 and P2 are shown in the bottom part of Figure 5. The aggregate demand curve connects them with points that other price levels generate.

The aggregate supply curve comes from the resource market. Though these markets may adjust slowly, when they finally do fully adjust, price level should have little or no effect on the amount of resources supplied. If a doubling of *all* prices and wages results in more or less output, someone is suffering from **money illusion**. The person believes either that he is better off at a higher nominal (but same real) wage, or that he is worse off with higher prices which have been fully compensated with higher wages. If people realize that money is merely an intermediary, and ultimately goods trade for goods, price level should not matter.

The point of the last paragraph is important enough to explain in a more concrete manner. Suppose Edward has a paper route and at the end of each week his income is $25.00. He spends his entire income on 15 hamburgers which cost $1.00 each and 20 soft drinks which cost $.50 each. One day Edward wakes up and finds that his weekly income has doubled to $50, but all prices have also doubled. Is he any better or worse off? Clearly he is not. A week of delivering newspapers still trades for 15 hamburgers and 20 soft drinks. He has no reason to work either more or less.

If behavior does not change when price level does, output will not depend on price level. The result will be a perfectly vertical aggregate supply curve, which Figure 5 shows. In the long run, when prices and wages fully adjust to any change in total spending, resources and output determine output.

In the short-run, however, anm adjustment process of the sort described in Chapter 11 seems more appropriate. We have argued that prices can be sticky, especially in resource markets. We have also suggested that expected rates of inflation can affect the way prices are set. Once we allow these possibili-

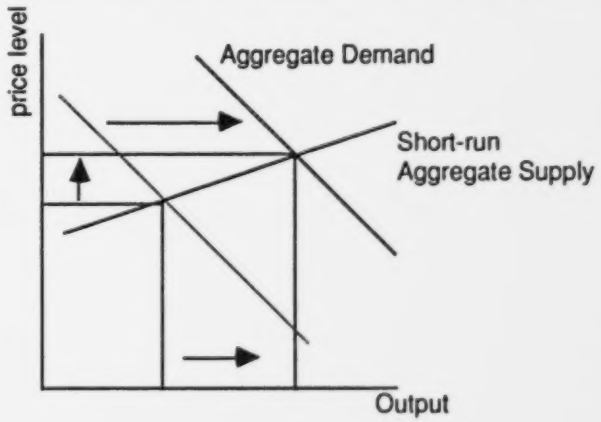


Figure 14.6 If aggregate supply is flat in the short run, a shift in aggregate demand will have a big effect on output.

ties, we have a system in which it may take years to reach long-run equilibrium. It is even possible that the system will never reach equilibrium, but, as the business-cycle writers thought, will fluctuate forever in the adjustment process.

Once we add stickiness to prices and give a role to expected inflation, a change in spending will not simply move the economy up or down a vertical aggregate-supply curve. The upward-sloping curve in Figure 6 shows what is likely in the short run. A change in spending will move the aggregate-demand curve. If the aggregate-supply curve is fairly flat, there will be a large change in output and a small change in price level.

Aggregate supply and aggregate demand is an attractive framework. It is simple, with the same structure as supply and demand. However, the assumptions behind aggregate supply and aggregate demand are totally different from those behind supply and demand, that is, aggregate supply and aggregate demand curves are not obtained by adding up all the supply and demand curves in an economy. If they were, one would expect that the long-run aggregate-supply curve would be flatter than the short-run aggregate-supply curve, as is the case with a normal supply curve. But the aggregate supply curve grows steeper the longer the time for adjustment.

Aggregate supply and aggregate demand is more general than ISLM, and overcomes some of the limitations of ISLM. It includes price level as a variable, and it shows that resource markets matter. It also lets one consider cases in which disturbances originate in a resource market, such as a disruption of oil supplies, which ISLM cannot handle.

Aggregate supply and aggregate demand gives some insight into the adjustment process. Observation of the real world tells us that when spending suddenly changes, output changes initially more than prices, and only after considerable delay do prices change more than output. Aggregate supply and aggregate demand yields this pattern.

Aggregate demand and aggregate supply show an adjustment process. It does this with a series of short-run equilibria. Alfred Marshall originated this technique with regular supply and demand. He had three periods: the market period or the very short run, in which output was fixed; the short run, in which capital was fixed but utilization of capital was not; and the long run, in which nothing was fixed. So far the expositions of

aggregate supply and aggregate demand have been fuzzy about what is fixed in the short run that is not fixed in the long run. This fuzziness remains as a problem of aggregate demand and aggregate supply.

SUMMARY

The quantity theory of money aggregates the economy into only two markets, the market for money balances and the market for all other things. The simple income-expenditure model involves an equally drastic but different aggregation, to a market for goods and services and a market for all other things. Then each, by Walras' Law, ignores the second market and focuses on only one market. These drastic aggregations make sense if the main source of problems in a market economy arise in one sector and the problems that are evident in other sectors are simply reflections of problems that originate in that one sector.

The drastic aggregation of both the simple income-expenditure model and the quantity theory of money have made many economists uncomfortable. A year after the publication of the *General Theory*, John Hicks proposed a less dramatic aggregation that he saw as a more general case of both the quantity theory and the simple income-expenditure model. His model has become known as the ISLM model and is the standard model of macroeconomics. Part of its popularity undoubtedly lies in its ability to present macroeconomics in terms of a model with exactly the same structure and mechanics as the model of supply and demand.

The chapter showed some of the problems of the ISLM approach, and developed a second supply-demand framework which has become popular, the aggregate supply-demand framework.

QUESTIONS

1) A person living next door to the bank keeps the average size of his checking account very low, going next door whenever he needs extra money in his account and transferring money from a savings account. What will happen to the average size of his checking account balances if he moves five miles away from the bank? Explain. (Assume that his checking account balances earn no interest.)

2) Suppose the IS and LM curves in Figure 3 show equilibria in the goods and money markets, respectively. Assume that these markets are clearly defined and separated. What effect on the curves and on overall equilibrium will the following events tend to have (will the curves shift right or left, will interest rates and income go up, down, or be uncertain?)

	IS	LM	i	Y
a) The Fed raises the discount rate.	___	___	___	___
b) The Fed buys bonds in the open market.	___	___	___	___
c) People decide that at any level of income they need smaller cash balances.	___	___	___	___
d) The government cuts taxes.	___	___	___	___
e) For some unknown reason banks start accumulating excess reserves.	___	___	___	___
f) Exports rise.	___	___	___	___

g) The government introduces a sales tax and the Fed sells bonds in the open market.	___	___	___	___
h) The Fed lowers the required reserve ratio.	___	___	___	___
i) For unknown reasons peoples' mpc rises.	___	___	___	___
j) Autonomous investment rises.	___	___	___	___
k) The government starts building subway systems in all cities with more than 500,000 people.	___	___	___	___
l) Interest rates rise.	___	___	___	___

3) Suppose Figure 3 in the chapter was a supply and demand graph rather than an ISLM graph. What would point *a* represent in terms of buyer and seller equilibrium?

4) ISLM divides the economy into two markets: the goods market, which is in equilibrium when planned expenditures equal income, and the money market, which is in equilibrium when money demand equal money supply. The interest rate affects both markets and helps connect them. Below is an example. (For the equations behind these tables, see question 4 after the appendix to this chapter.)

GOODS MARKET:

			INVESTMENT if interest rate =		
INCOME	CONSUMPTION	GOVERNMENT EXP.	4%	6%	8%
450	410	10	60	50	40
500	450	10	60	50	40
550	490	10	60	50	40
600	530	10	60	50	40
650	570	10	60	50	40

MONEY MARKET

	VELOCITY if interest rate =		
MONEY SUPPLY:	4%	6%	8%
100	5	5.5	6

a) If the interest rate is 4%, at what level of output is the goods market in equilibrium? What is equilibrium output when the interest rate is 6%? At 8%?

b) If the interest rate is 4%, at what level of output is the money market in equilibrium? What is equilibrium output when the interest rate is 6%? At 8%?

c) Use your answers in parts a and b to plot IS and LM curves. At what level of interest rate and output are both markets in equilibrium?

d) Suppose government spending increases by 20 to 30. What happens in the model? What happens to the curves, and what are new equilibrium output and interest rate?

e) When government spending increases by 20 in part d, there is a higher interest rate in equilibrium which causes investment to decline. How much of investment does the increase in government spending crowd out? What would the multiplier be if there was no crowding out, and what is it with crowding out?

f) Assume that velocity does not depend on the amount of money. Suppose money stock decreases to 83 1/3. What happens in the model? What is the new equilibrium?

6. Tax changes alter incentives people face. Suppose a tax increase decreases the amount people want to spend (which fiscal policy predicts), and also decrease the amount they want to produce (a possible incentive effect). What will this tax increase look like in the ISLM model? Can you show the incentive effects? What will it look like in the aggregate demand-supply model?

APPENDIX

The simple form of ISLM model can be presented with basic algebra. The only change in the income-expenditure model equations is in the investment equation, which becomes:

(1) $I = d + fYe + hi$.

In this equation d is the intercept, f tells by how much investment will rise when expected income rises by $1.00, h tells by how much investment changes when interest rates change, and i is the interest rate. h should be a negative number. Higher interest rates yield lower investment.

Our modified income-expenditure model now has these equations:

(2) $C = a + b(Ye-T)$

(3) $G = g$

(4) $I = d + fYe + hi$

(5) $T = t$

In equilibrium expected income equals actual income, and actual income is always equal to actual expenditures, or:

(6) $Ye = C + I + G$

Substituting equations 2-5 into 6 gives:

(7) $Ye = a + b(Ye-t) + d + fYe + hi + g$.

Rearranging terms and solving for Ye gives:

(8) $Ye = (1/(1-b-f))(a - bt + d + g + hi)$.

Equation 8 has two unknowns, the interest rate and expected income. This is the equation for a line. Assuming that the multiplier is positive and h is negative, the line will have a negative slope. The line is, of course, the IS curve. However the model is now incomplete since it does not have a unique solution for income. There are many equilibrium incomes, one for each level of interest rate.

Adding in the monetary sector completes the model. The demand for money equation is

(9) $Md = kYe + wi$.

The assumption that money stock is determined by policy gives:

(10) $Ms = m$.

The equilibrium condition that money supply equals money demand is:

(11) $Ms = Md$.

Solving equations 9, 10, and 11 for Ye gives:

(12) $m = kYe + wi$

or, rearranging terms,

(13) $Ye = m/k - (w/k)i$.

This equation with two unknowns is also the equation for a line, the LM curve. Since w is negative, the line will have a positive slope. The steepness will depend on how large w is relative to k. If $-w$, which is the responsiveness of money demand to interest rates, is large, then the slope in Figure 2 will be flatter. (Note that interest rate is on the vertical axis.) A small change in interest rates (the rise) will yield a large change in Ye (the run). If k is large relative to $-w$, the slope will be steeper. In the extreme case of w/k equalling zero, the LM curve becomes a vertical line.

Note that one could solve equations 1 to 11 directly for equilibrium income. While easier algebraically, this method does not yield the beautiful curves that look just like supply and demand curves which economists enjoy so much.

MORE QUESTIONS

1) Consider the following equations in which symbols are as we have been using them:

C= 18 + 3/4Ye
I = 3 - ki (k will be explained below)
Ms = 20
Md = 1/2Ye - 2i

a) If k is zero, what is equilibrium income? What is equilibrium interest rate? What is the multiplier? (Hint:

equilibrium income is determined only in the goods market and equilibrium interest rate is determined only in the money market.)

b) Suppose k = 1/10. What will equilibrium interest and income be? What will the multiplier be?

2) Consider the model below:

Y= C + I + G
C = 10 + .8(Y-T)
I = -10 + .2M
G = 20
T = 20
M = 100 + .5(G-T)

What is the equilibrium condition for this model? How would you explain the last equation verbally? If government spending increases by $1.00, by how much does equilibrium income increase?

3) Solve the following set of equations for an equilibrium:

Ye = C + I + G
C = 10 + .6Ye
I = 10 + .2Ye - 3i
G = 8
Ms = Md
Ms = 100
Md = 51 - 3i + .5Ye

a) Solve for the IS and LM curves and fill in the tables below:

IS		*LM*	
i	Ye	i	Ye
0%		0%	
1		1	
2		2	
3		3	
4		4	
5		5	

b) If G increases from 8 to 10, what happens to the IS curve? What will happen to the LM curve? What will happen to equilibrium income and interest?

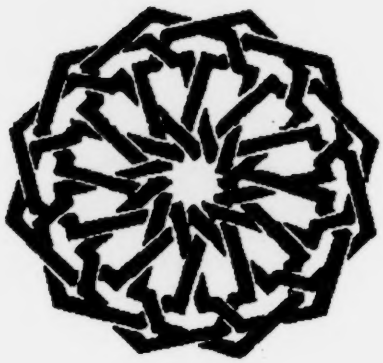
c) If Ms rises to 102, what happens to the IS curve? What happens to the LM curve? What happens to equilibrium income and interest?

d) Which numbers in the equations above affect the IS curve? Which affect the LM curve? Do any affect both?

4. The equations used to generate the tables in question 4 are:

C = 50 + 4/5(Y)
G = 10
I = 80 - 5(r)
Md = (1/4)(Y) - (25/4)(r)
Ms = 100

a) Add to these equations whatever equilibrium conditions you need, then solve the equations for equilibrium income and interest rate. b) In part f of question 4, we assumed that velocity was independent of money stock. Suppose money stock is 200 and interest rate is 6%. What level of income do the money supply and money demand equations need for equilibrium? What will be the velocity of money at this level of equilibrium? Is velocity of money independent of the amount of money in this model?



CHAPTER 15

PROBLEMS OF FEEDBACK

After you finish this chapter and work the questions at the end, you should be able to:

Outline the life-cycle and permanent-income hypotheses.
Explain how the full-employment deficit or surplus is computed.
List the problems of using a monetary aggregate as a measure of monetary policy.
List the problems of using interest rates as a measure of monetary policy.
Explain what a policy rule is.

The ISLM model of the last chapter has three fundamental assumptions about how people behave: consumption depends on expected income, investment depends on interest rates, and money demand depends on interest rates and expected income. The first, the consumption function, was the basis for the simple income-expenditure model. The other two, that both investment and the demand for money depend on interest rates, result in the addition of financial markets to the model.

In examining all three of these assumptions about behavior, economists have had to struggle with the problem of feedback. Feedback, as Chapter 11 explained, exists when causation runs two ways, when changes in variable A cause changes in variable B, but in turn changes in variable B cause changes in variable A. This chapter examines some feedback problems with which macroeconomics has had to deal.

CONSUMPTION

Shortly after Keynes published *The General Theory*, economists had a chance to test one of its central assumptions, that consumption depended on income. As a result of efforts to mobilize the economy for World War II, the U. S. government developed and made available in 1942 comprehensive national accounts data for the previous decade. Economists used the data to plot a consumption function, and found that the points almost formed a straight line. Since income could explain almost all changes in consumption, this line seemed to imply that any other influences must be minor.

However, this procedure of finding a consumption function overstates the influence of income on consumption. It does not allow for any effect of consumption on income, but assumes that the only source of the relationship comes from the effect of changes in income on changes in consumption. But this clearly cannot be because consumption is the largest part of income. Thus even if income had no influence on consumption, there would be a relationship between income and consumption.

To see this, consider the procedure shown in Table 1. Table 1 contains thirty random digits (taken from a table of random digits) split into two groups of fifteen each and labeled A and B. Column C is obtained by multiplying each number in group A by three. Column Y is obtained by adding columns B and C. There will be a relationship between columns C and Y even though Y had nothing to do with the way in which C was obtained. (See question 1 at the end of the chapter.)

To get a better estimate of the influence of income on consumption, we need to take out any influence that flows from consumption to income. A bit of mathematics and analysis that can wait for more advanced courses can solve this feedback problem. When it is solved, the relationship between consumption and disposable income is weakened only a little. Disposable income remains the dominant determinant of consumption spending, but it is not the only thing that can matter.

In examining why people spend the amount they do, a logical starting point is to ask what goals they have. Two goals seem reasonable

TABLE 1
BUILDING A "CONSUMPTION FUNCTION" WITH RANDOM DIGITS

A	B	C	Y
1	2	3	5
8	1	24	25
3	6	9	15
8	2	24	26
2	1	6	7
7	4	21	25
9	0	27	27
5	5	15	20
7	9	21	30
7	0	21	21
1	4	3	7
5	9	15	24
6	2	18	20
5	7	15	22
1	5	3	8

for a great many people. First, they prefer a higher standard of living to a lower standard of living. In other words, people want the highest level of consumption spending they can get. Second, most people prefer to have a roughly constant standard of living through time. They do not like to live on a roller coaster, with one year of feast followed by a year of famine.

Put together, these two goals suggest that we assume that people try to maintain the highest, smooth consumption path which they can get. Presented in this way, discussion of consumption behavior becomes a problem which the tools of microeconomics are designed to examine (with budget lines and indifference curves).

Consider, for example, a person who will earn $10000 this year and $5000 next year. Ignoring all future years, how should he spend? The idea that he wants a smooth consumption path suggests that he should save part of this year's income and spend it next year. Alternatively, if the person earned the $5000 this year and the $10000 next year, the goal of a high smooth consumption path suggests that he borrow in the first year and pay back in the second. An important function of financial markets from the point of view of consumers is that these markets help one maintain a constant standard of living despite fluctuations in income.

The idea that people have fluctuations in income which they want to smooth is the basis of the **life-cycle hypothesis** of consumption which was produced by Franco Modigliani, Richard Brumberg, and Albert Ando in a series of articles in the 1950s and 1960s. The life-cycle hypothesis asks why people save. It answers that people generally live longer than they earn income—that is, people usually retire. If they are to keep spending after they no longer earn income, they must have accumulated assets while they were earning so that they can dissave. (Few are willing to lend to those who have no prospect of future income.)

Suppose a 20-year-old person expects to live 50 years more, but only to work for 40 of those years. He expects to earn $20,000 each year. Ignoring interest, this person will have earnings of $800,000 to spread over 50 years. If he spends $16,000 a year, he will die with zero assets left. To get this spending pattern, he saves $4,000 each year while he works, and at retirement will have assets of $160,000.

Now suppose that the person in the above example begins with assets of $200,000. He will then have a lifetime amount of $1,000,000 that can be spent. He will be able to spend $20,000 each year and die with zero assets. Thus the life-cycle hypothesis introduces wealth as a factor into the consumption function. Consumption can be financed either through income or through the sale of assets, and an increase in either should increase consumption.

By looking at what a "typical" individual should do, the life-cycle hypothesis builds microeconomic footings for the consumption function. Behavior is goal-directed in the life-cycle hypothesis, while it is not in the original Keynesian consumption function. This latter consumption function is mechanical without a reason. Since economists prefer behavior which can be explained in terms of people pursuing goals, it is no surprise that the life-cycle hypothesis has become popular.

The life-cycle hypothesis can be expanded to take into account savings for bequests for heirs, for uncertainty of when death will occur, for the existence of social security, for the interest rate, and for various patterns of lifetime earnings. It does not deal well with what should happen if incomes fluctuate erratically over time, but for this situation another theory, the permanent-income hypothesis, provides an answer. The permanent-income and life-cycle hypotheses are not contradictory theories, but theories which nicely complement each other.

Milton Friedman proposed the **permanent-income hypothesis** in a book published in 1957. The central idea of the theory is simple: people base consumption on what they consider their "normal" income. In doing this, they attempt to maintain a fairly constant standard of living even though their

incomes may vary considerably from month to month or from year to year. As a result, increases and decreases in income which people see as temporary have little effect on their consumption spending.

The idea behind the permanent-income hypothesis is that consumption depends on what people expect to earn over a considerable period of time. As in the life-cycle hypothesis, people smooth out fluctuations in income so that they save during periods of unusually high income and dissave during periods of unusually low income. Thus a pre-med student should have a higher level of consumption than a graduate student in history, if both have the same current income. The pre-med student looks ahead to a much higher future income, and consumes accordingly.

Friedman suggested a way to determine permanent income so that the theory could be tested against available data. He suggested that on the average people would base their idea of normal or permanent income on what had happened over the past several years. Thus if they computed permanent income as the average of the past four years, and income had been $13,000, $10,000, $15,000, and $8,000, they would consider their permanent income as $11,500.

Both the permanent-income and life-cycle hypotheses loosen the relationship between consumption and income so that an exogenous change in investment may not have a constant multiplier effect. This is more clearly seen in the permanent-income hypothesis. This theory suggests that people will try to decide whether or not a change of income is temporary. If they decide that it is, they will not let it have much effect on their spending. Only when they become convinced that it is permanent will consumption change by a sizable amount. Again, this theory is not assumed to describe all households, but only what happens on the average.

The life-cycle hypothesis introduced assets into the consumption function, and gave a role to the stock market. A rise in stock prices should increase consumption and a fall reduce consumption. Thus financial markets matter for consumption as well as for investment. The permanent-income hypothesis introduced lags into the consumption function. An increase in income should not immediately increase consumption spending by very much, but with time it should have a greater and greater effect. Behavior that introduces a lag into the relationship between income and consumption will generate the sort of momentum which business-cycle theories saw. A change in spending changes income, but people only slowly adjust to it. As they do, their extra spending changes income further. An initial increase in spending tends to have effects that take a long time to completely unfold.

The existence of lags also makes government attempts to control the economy more difficult. Policies taken do not have their full effect immediately, but only gradually. By the time they have their full effect, the problems which they were designed to attack may have disappeared. Chapter 16 will consider the problems which lags pose to those who make economic policy.

Finally, though the life-cycle and permanent-income hypotheses have greatly increased our understanding of consumption behavior, data from the economy does not always fit theory as well as it should. It seems that some people do not plan over time as theory says they should. Though economic theory predicts that people should smooth fluctuations in income by saving or borrowing, some people have found other strategies for dealing with income fluctuations. The author knows one person who balanced his budget with alcohol. Any money left at the end of the week was used for liquor. As a result, the non-alcohol part of living standard was fairly smooth, but alcohol consumption was quite erratic. Strategies of this sort will give results that violate what consumption theory predicts.

INVESTMENT AND FISCAL POLICY

Ignoring feedback led many economists to emphasize that the correlation between consumption and income resulted solely from effects of income on consumption. As a result, their estimations of the simple consumption function gave results that looked stronger than they actually were. In contrast, ignoring feedback between investment and income led many economists to treat the correlation here as solely the result of effects of investment on income. To many of these economists, a simple income-expenditure model such as that in Chapter 12 largely explained how the world worked. Autonomous (and thus unexplainable) changes in investment would change income, and these changes would be multiplied by the feedback between income and consumption. If, however, one can explain changes in investment by changes in income or financial conditions, then the simple income-expenditure model will be a partial and perhaps misleading way to view the world.

In discussing the IS curve, Chapter 14 outlined why business investment should be sensitive to both interest rates and expectations of future earnings. In addition, investment includes residential construction and changes in inventories. These forms of investment respond to financial conditions and total spending, though not in the same ways as business investment. As with consumption, changes in investment may react to changes in the economy with a time lag.

The discussion of investment in the chapter on business cycles suggested that changes in income could affect investment through the accelerator principle. In 1939 Paul Samuelson published an article which showed how the accelerator could be combined with the income expenditure model to give a dynamic model. In this model investment causes changes in income and in turn changes in income (or consumption, depending on how the model is structured) cause changes in investment. Because the accelerator principle was explained in Chapter 11, and because models similar to Samuelson's are fairly simple to work through, we will skip elaboration of the topic here and present it in the form of question 2 at the end of the chapter.

Measuring fiscal policy involves feedback problems, but there has been little controversy in economics about how to eliminate them. Almost all economists agree that the **full-employment budget surplus or deficit** is a reasonable way to measure fiscal policy.

If the government desires to increase total spending in the economy, it can either increase its spending or reduce taxes (or both). Either policy will increase the government's deficit (or reduce its surplus). Because policies which increase the deficit are expansionary and policies which decrease it are contractionary, it would seem reasonable to use the government's deficit or surplus as a measure of how tight or easy fiscal policy is.

Such a conclusion ignores feedback. Suppose the government leaves spending and taxing policies unchanged, but the economy enters a recession. The lower income levels which the recession causes will cut tax receipts (most taxes are income or sales taxes), and transfers will increase as more people qualify for various welfare programs and unemployment compensation. The government's budget will move into a (larger) deficit even though there has been no change in policy.

Two sorts of factors influence the size of the deficit: changes in policy and changes in the economy. As an indicator of fiscal policy, the deficit suffers from a problem of feedback: the size of the deficit affects the performance of the economy, but the performance of the economy affects the size of the deficit. What is needed for a measure of fiscal policy is a measure which is not affected by changes in the economy. Only such a measure will be a reliable indicator of how government policy is changing.

To construct an acceptable measure of fiscal policy, one must eliminate feedback effects from the economy. This can be done by

constructing a hypothetical government budget. Economists estimate what government expenditures and tax receipts would be if the economy were at full employment and calculate the deficit or surplus from this budget. This measure can only be affected by changes in policy; it is holding the economy constant. (See question 5.)

Economists use this measure, the full-employment surplus or deficit, for research and for forecasting. Incumbent politicians use it to put their best face forward. If the economy has less than full employment, the actual government deficit will be larger than the full-employment deficit. (Can you explain why?) Since voters consider deficits undesirable, incumbents prefer to give them the smallest deficit which they can, and this is the full-employment deficit. Economists may not always approve of this practice, but, as atomic physicists have found, ideas often end up being used in ways their discoverers disapprove of.

The feedback relationship that makes the full-employment budget necessary also gives rise to an *automatic stabilization* pattern which many economists stress. Because most taxes are paid on income or consumption, when output decreases, tax receipts drop and when output increases, tax receipts rise. Recall that taxes are a leakage in the flow of spending, and that when leakages increase, the income-expenditure model says that spending will fall and that when leakages decrease, spending rises. Hence lower output reduces leakages and reduced leakage helps stop the decline in output, and higher output increases leakages, and the increased leakage helps stop the rise in output.

MEASURING MONETARY POLICY

The quantity-theory framework of Chapter 9 suggests that monetary policy should be measured by the quantity of money in circulation. By this measure, a 10% growth rate in money indicates an "easier" policy than does a 2% growth. This is an obvious way to measure monetary policy in this framework because money enters directly into the equation which determines total spending: money multiplied by velocity equals total spending.

In the ISLM framework, however, money enters the equation which determines total spending only indirectly. The line of causation runs through the financial markets: a change in money changes interest rates, which changes investment, which is part of GNP. From this perspective it is not obvious that one should use money stock as a measure of monetary policy—interest rates are an alternative possibility. Using interest rates puts one closer to the determination of GNP than does money stock. In this interpretation, higher interest rates signal a "tighter" monetary policy and lower interest rates signal an "easier" monetary policy.

The question of what is the best way to measure monetary policy has spurred considerable debate in economics. Let us begin by reviewing the arguments for using interest rates. We will explain the argument by examining what must be going on in the financial market.

The financial market can be seen in terms of a supply of and a demand for loanable funds. The exact shapes of these curves are unknown. One can argue that the supply curve is very steep because interest rates do not greatly affect savings, or one can argue that it is very flat because any one country is but a small part of the international financial market. Neither is it clear how responsive demanders are to interest rates. Nonetheless, financial markets can be represented in terms of supply and demand curves such as those in Figure 1.

Suppose that the amount of money increases. In a modern credit economy the additional money flows through the financial markets and will influence the curves in Figure 1. In particular, an increase of money will be created by banks either through the lending of money to customers or by purchasing existing debt from people who want to sell it. In either case, the banks are supplying funds to the financial markets. In terms of

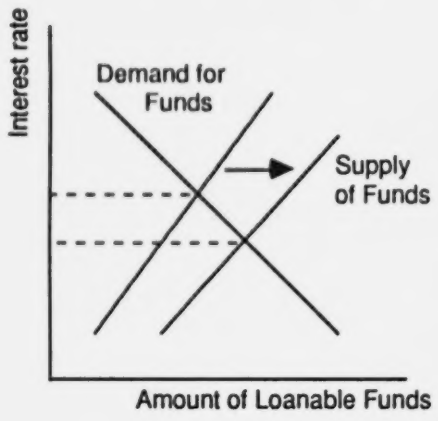


Figure 15.1 The Supply and Demand for Loanable Funds.

Figure 1, the increase of money will shift the supply curve to the right and lower interest rates. A decrease in money will shift the supply curve to the left and increase interest rates.

The advantage of using interest rates to measure monetary policy, according to its proponents, is that it makes clear the *transmission* process by which an increase in money affects total spending. On one hand, if one accepts that financial markets transmit the preponderance of the effects of a change in money to spending, then interest rates should indicate the impact of a change in money stock. Further, any changes in demand for money which offset or accentuate the impact of a change in money will also show up in the interest rates. Thus if people suddenly decide to hoard money at the same time the central bank increases it, there will be little effect on interest rates or the economy, and watching interest rates will give a more accurate picture of what the effect of the increase in money will be than will watching money stock. On the other hand, if there are important channels of transmission other than the financial markets, interest rates may give misleading results. But those who prefer money to interest rates as an indicator have not come up with a convincing explanation of what the other avenues of transmission are.

Those who prefer interest rates to a measure of money stock point out that there are several measures of money (or several *monetary aggregates*, to use economists' jargon) available, and those who want to use a measure of money cannot agree among themselves which is best. Further, in a period of rapid financial change, such as in the late 1970s and early 1980s, rules and regulations involving checking accounts change, and behavior should change as well. As a result, there is even more than normal confusion about how to measure money, and one should not expect any measure of money to be a good indicator of the effects which monetary policy will have on the economy.

Finally, those who argue that interest rates are the better way of measuring money often point to a problem in using money, the problem of **reverse causation**. There is an impressive correlation between changes in money and changes in total spending, but it is unclear how much of this correlation is due to changes that move from spending to money. One can view the amount of money determined as in the interaction of supply and demand. The interest rate is the price of money, and there is a positively sloped demand curve and a negatively sloped supply curve. If income falls, people will demand less money at any rate of interest, or the demand curve shifts left. The money market will find its equilibrium at a lower rate of interest and a lower amount of money. Thus a change in income may cause changes in money rather than vice versa. We saw earlier that this argument will not work with a commodity money, but it can have merit if the central bank establishes certain sorts of policy rules.

Those who prefer to use the stock of money to measure monetary policy point to episodes in which they believe interest rates clearly gave the wrong story about monetary policy. In the late 1960s and early 1970s the growth rate of money increased (with some fluctuations) which indicated that monetary policy was getting easier and easier. Interest rates, on the other hand, also rose in this period, which indicated that monetary policy was

getting tighter and tighter. Those who prefer money as an indicator argue that the analysis above using Figure 1 ignores the effect of inflation, and once inflation enters, changes in money and changes in interest rates need not be inversely related.

Suppose there is a rapid increase in money stock. Initially the increase in money supplies funds to the market, reduces interest rates, and spurs spending. Suppose the increased spending is large enough to increase the rate of inflation. But as prices rise and people begin to expect inflation, the demand curve in Figure 1 shifts to the right, and interest rates rise. Once people begin to expect higher inflation, they change their behavior regarding borrowing. Chapter 9 explained why a higher expected rate of inflation will shift the demand curve for funds to the right. Further, if people learn to expect inflation from rapid increases in money, the time lag between an increase in money and a shift of the demand curve will be short. Hence, it is very possible that an increase in money can cause an increase in interest rates, not a decrease. Thus higher interest rates do not necessarily mean tighter monetary policy.

One can eliminate the inflation problem by looking at real rates of interest rather than nominal rates. Since the real rate is the nominal rate less the expected rate of inflation, all one has to know is the expected rate of inflation. Unfortunately, knowing this poses problems which have not yet been solved. And even if one knows the real rate of interest, problems remain with interest rates as an indicator of monetary policy.

Interest rates are sensitive to business fluctuations. In a boom, when profits are rising and businesses decide they need to expand their productive capacity, they are willing to borrow more at each rate of interest, or in terms of Figure 1, the demand curve for loanable funds moves to the right. Savings may also increase, but the shift they cause in the supply curve of loanable funds need not match the shift in the demand curve. Historically, interest rates have risen during periods of boom and fallen during periods of recession. There is a "reverse causation" problem for interest rates. Changes in interest rates may not indicate "tighter" or "easier" monetary policy. Instead they may indicate that business conditions have changed.

Those who argue that monetary aggregates are the best way to measure monetary policy cannot dismiss the problem of reverse causation. There are cases in which the amount of money clearly seems to have been influenced by changes in economic activity, and, indeed, cases seemed so obvious to "monetarists" before Keynes that they built business-cycle theories on the basis of two-way causation between money and income. However, most people who prefer monetary aggregates believe that most of the correlation between fluctuations in money and income cannot be explained by the effects of income on money. In effect they argue that those who present the reverse-causation position lack a plausible transmission mechanism. Thus many of the fluctuations in money can be explained in terms of changes in income, but sometimes the explanation must appeal to gold flows, sometimes to bank borrowing or other bank behavior, sometimes to currency-deposit substitution of the public, and other times to reactions of the central bank. The way reverse causation works has continuously changed over the past century as financial institutions and the financial environment have changed. Those who favor monetary aggregates argue that it is implausible that a close correlation between money and income, lasting over a century and apparent in many countries, can be due to such an ever-changing variety of transmission processes.

There is another way to present the arguments involved in this dispute. Consider the market for oranges. One could measure the "tightness" of the orange market either by the number of oranges exchanged or by the price of oranges. An increase in the supply of oranges (movement of the supply curve right) would decrease price and increase quantity, both indicating "easier" conditions. But an increase in demand (movement of the demand curve right) would increase quantity, indicating "easier" conditions, and increase

price, indicating "tighter" conditions. Price better indicates the "ease" or "tightness" of the orange market because it responds correctly to both changes in demand and in supply. Could not one make the same argument for money, showing that the price of money, the interest rate, is a better indicator of ease or tightness of monetary policy than is the quantity of money?

Those who prefer monetary aggregates generally answer this question by denying that the interest rate is the price of money. The price or value of an orange is what one can get in exchange for it. The price or value of money is what one can get in exchange for it. One gets goods and services for money. If one gets fewer goods this year than last year for money, the price of money has fallen. The proper way to measure the value of money, according to this argument, is to look at the inverse of the price level.

The argument that the price of money is the inverse of the price level should lead economists to use it as the proper indicator of whether monetary policy is easy or tight. Some economists do rely on measures of this kind; the value of foreign exchange when exchange rates float has been used as an indicator of whether monetary policy is easy or tight, and the justification for tying money to gold is that this linkage keeps the price level constant (or almost constant). There is a lag, however, between a change in the supply of money and a change in the price level. Many economists believe that if they want to know what is happening to monetary policy now, looking at changes in the amount of money will tell them more than any other indicator.

Disagreement about how to measure monetary policy leads to very different interpretations of the past. For example, the United States experienced rapid growth in 1964 and 1965. A monetary explanation notes that the growth of money kept increasing during the first half of the 1960s. From 1961 to 1962, money stock rose by 2.1%, and in the next three years it rose by 2.9%, 3.9%, and 4.2%. For the monetary explanation this indicates monetary policy was becoming increasingly easy, and no other factors are necessary to explain the rapid growth in spending.

An alternative explanation notes that interest rates changed little during these years, rising very slightly from 1963 to 1965. Thus it does not see the source of growth in monetary policy. Rather it looks to the large fiscal expansion, primarily in the form of a major tax cut in February of 1964. In this view, the tax cut was the force which propelled the expansion. Monetary policy merely accommodated it, that is, did not stand in its way. Arthur Okun summarized this view as follows:

> "[T]he monetary policy that was actually pursued would not in itself have quickened the pace of the economy. It supplied a good set of tires for the economy to move on, but fiscal policy was the engine of growth."[1]

The dispute about why output dropped in the U.S. from 1929 to 1931 is another example of the importance of the indicator. For a person using money as an indicator of monetary policy, the explanation of the drop is straightforward. The amount of money fell throughout the period from late 1929 until early 1933, and thus "tight" money explains the drop in output for the entire period. Milton Friedman and Anna Schwartz draw this conclusion in their *A Monetary History of the United States, 1867-1960* (Princeton University Press, 1963). In their interpretation an ordinary recession was turned into a severe depression by the large number of bank failures. As people lost faith in the banking system, they converted deposits into currency. The loss of currency reduced bank reserves, and since a dollar of bank reserves could support several dollars of checking-account money, this conversion of deposits into currency reduced money. If the banks had not been allowed to fail, or if the Federal Reserve had offset the withdrawal of currency, the Depression, according to this view, would have been an ordinary, minor reces-

[1] *The Political Economy of Prosperity*, (New York: Norton, 1970) p. 59.

sion.

For a person who watches interest rates, the story looks very different. How can one be sure that the fall in spending did not cause the fall in money, rather than vice versa? Peter Temin in argues that if a change in money is autonomous, that is, not caused by a change in income, "then we should be able to observe a temporary [change] in the rate of interest on assets bearing some resemblance to money."[2] To use an analogy, one expects that if there is a shortage of apples, one should be able to see effects in the prices of closely related goods, such as in the price of oranges or pears.

Interest rates rose late in 1929 and again late in 1931, so Temin argues that monetary forces probably played some role in the start of the Depression and in its later stages. But from 1929 until late 1931, short-term interest rates fell, from about 6% to about 2%. In particular, Temin sees no rise in November and December of 1930, months of the first runs on banks and an episode which Friedman and Schwartz say changed the character of the decline. Long-term rates do increase, from about 5 1/2% to about 6 1/2%, but this is not enough evidence to stop Temin from concluding that money was passive from October of 1929 until September of 1931. Temin attributes much of the decline in spending during this period to an autonomous and unexplained drop in consumption.

Economics can be frustrating when two contradictory explanations can interpret the data equally well. Temin explains away the drop in money as the effect rather than the cause of the drop in income. Friedman and Schwartz explain away the failure of short-term interest rates to rise by arguing that in a time of a banking crisis, there is a demand for liquidity by both banks and the public. Thus "banks and others were inclined to dispose of their lower-grade bonds; the very desire for liquidity made government bonds ever more desirable as secondary reserves; hence the yield on lower grade securities rose...while yields on government bonds fell."[3] Temin argues that an autonomous decrease in money should cause short-term interest rates to rise as people sell short-term assets trying to regain their lost money balances, while Friedman and Schwartz argue that when a banking panic reduces money, the desire for safe, liquid assets causes people to *buy* short-term assets.

The dispute among economists about how monetary policy should be measured reflects a division on how they view the economy. The economy is too complex for any human brain to fully understand. As a result, people try to make sense of it in terms of simplified mental pictures. In some of these pictures, changes in money are more directly and closely related to the determination of spending than in others.

Both sides of the dispute appeal to feedback (or reverse causation) in arguing their position. Those who believe that interest rates are the best way to measure monetary policy argue that some movements in money stock are caused by changes in economic activity, and thus it is misleading to try to explain movements in total spending in terms of movements in money. Those who believe that a monetary aggregate is the best way to measure monetary policy argue that movements in money are only one of many forces affecting interest rates. Expectations about the future course of economic growth and about future rates of inflation, both of which depend in part on past and present economic conditions, can cause large changes in interest rates.

The dispute over how to measure monetary policy involves assumptions about people's demand for money and about the role of interest rates on investment. From the discussion above, however, you will not see the full role that the demand for money plays. The above discussion focuses on the financial markets which ISLM dismisses by an appeal to Walras' Law. (ISLM assumes that the economy can be aggregated into three markets: money, goods, and everything else. If the first two markets are in equilibrium, the third also must be in

[2] *Did Monetary Forces Cause the Great Depression?* (New York: W.W. Norton & Co., 1976) p. 102

[3] *A Monetary History*, p. 312.

equilibrium. See Chapter 7.)

Consider what would happen in the ISLM model if the demand for money was independent of interest rates. Then if the amount of money changed, people would be thrown out of equilibrium and would not regain equilibrium until spending changed. Even if they all buy financial assets, and as a result interest rates change, they will still be out of equilibrium. Interest rates play no role in this case, and there is no rationale here to measure monetary policy with interest rates.

However, suppose that the demand for money is highly sensitive to interest rates. If money changes, people will still be thrown out of equilibrium. Now if they try to get rid of excess cash balances by buying financial assets, any decrease in interest rates will bring them closer to equilibrium. There is no need for spending to change at all for equilibrium to be re-established for those holding cash balances.

The chain which ISLM encourages us to see is a change in money causing people to be thrown out of equilibrium in terms of money holdings, but getting back into equilibrium by trading money for financial assets (or assets for money) and changing the interest rate. The change in the interest rate throws business out of equilibrium because at the new interest rate it will want to alter the amounts it invests. As business changes investment to get back into equilibrium, total spending changes. If *either* the demand for money is highly sensitive to interest rates *or* investment is insensitive to interest rates, monetary policy will have little effect in this model. If demand for money is highly sensitive, a small change in interest rate will make people happy to hold extra money, but a small change in interest will only have a small change on investment. If investment is not sensitive to changes in interest rates, then even big changes in money may have little effect on total spending.

POLICY RULES

The dispute about how monetary policy should be measured will continue for some time. One of the benefits of the dispute has been a new way of approaching policy that neither side originally saw. This way is to view policy not as something outside the system, but as something inside it.

We have already assumed that businessmen, employees, and consumers are inside the system and react to the environment of that system. Consumers, for example, make spending decisions on the basis of their expected permanent income and businessmen invest on the basis of expected profitability, which depends on the expected future course of the economy and interest rates. In these and in other cases of people making decisions which are important for macroeconomics, people look at their environment and calculate what course of action will best serve them.

Sometime after 1970 economists began to look at policy making in a similar way. Policy is made by people who have goals and who must calculate how best to achieve those goals given the environment they face. As long as the goals and the understanding of the environment are constant, the policy makers should make decisions which have a pattern to them. They should be predictable to someone who understands the goals of the policy makers and their understanding of the environment. This predictable pattern in policy is a **policy rule**.

A great many rules are possible. Here is a simple one. If the rate of unemployments is greater than 6%, the Federal Reserve acts to increase money stock. It it is less than 6%, the Fed decreases money stock. Real policy rules are rarely so simple because monetary policy makers almost always worry about a great many things in addition to unemployment. In this example, however, we would have a change in policy rule it the Fed began to worry about inflation in addition to unemployment.

Stress on policy rules instead of policy

itself has contributed to radical changes in the way many economists think about the economy. No longer do consumers and businesses react to fiscal and monetary policy, but now they react to fiscal and monetary *rules*. This means that we should expect people to anticipate how policy makers will act, and to make decisions based on these anticipations.

Compare these two policy rules. In rule A the government desires to keep unemployment below 5% and will conduct expansionary policy whenever the unemployment rises above it. In rule B the government desires to keep inflation below 4% and will conduct contractionary policy whenever the rate of inflation rises above it. Suppose that you are the leader of a large labor union. Will your bargaining position be affected by the policy rule? Probably it will. If you demand a wage increase so large that it causes unemployment and price increases, the harm your actions cause may be partially offset with rule A but they may be compounded with rule B. People involved in labor negotiations take into account how the government may react to the effects of their decisions.

The recent stress on policy rules has increased the importance expectations have in macroeconomic theory. It also suggests unexpected policy actions, can have very different results than the same policy actions when they are expected. The next chapter will discuss some of the ways that the emphasis on policy rules and expectations make stabilization policy more difficult.

SUMMARY

We began discussing macroeconomic theory by arguing that often changes in market A affect market B, and in turn the changes in market B come back and affect market A. This is a feedback pattern. Feedback interactions permeate macroeconomics. This chapter has examined a number which we have not previously considered. It looked at modern theories of consumption and at how fiscal policy is measured. It also looked at the long and indecisive debate about how monetary policy is best measured. Finally, it suggested that policy making should not be seen as something done outside the system and which then affect the system, but as part of the system itself.

QUESTIONS

1) Graph columns C and Y in Table 1 at the beginning of the chapter. Then draw a straight line through the points that best represent the pattern they form. Does your line look like a consumption function?

2) Suppose the performance of an economy can be described by the following set of equations which add an accelerator to a simple income-expenditure model:

$$Yt = Ct + It$$
$$Ct = 10 + .5(Yt\text{-}1)$$
$$It = 1(Yt\text{-}1 - Yt\text{-}2)$$

(Note: Yt is income in period t, Yt-1 is income one period ago, and Yt-2 is income two periods ago.)

a) The last equation says that investment depends on the difference between income last period and income two periods ago. What is the verbal interpretation of the consumption equation?

b) In equilibrium Yt will equal Yt-1 will equal Yt-2. Why? What is the equilibrium level of income in this model?

c) Because of the existence of lags, one can look at the adjustment process in this system. Suppose that Yt-2 is 19 and Yt-1 is 20. What path will this system generate

from t to t+7? (Hint: For t+3 the answer is 20.375.)

d) (For those with access to a computer.) Will the system ever reach and stay at its equilibrium value?

3) Though the life-cycle and permanent-income hypotheses were both developed in the 1950s, not until the presidency of Lyndon Johnson did most economists fully realize the importance of the idea that people could smooth out fluctuations in income. In 1967 the Johnson administration proposed a tax increase to curb rising inflation. The proposed tax was unusual because it was a temporary tax, designed to last only one year, and because it was a surcharge, a 10% tax on the taxes a person owed. The proposed tax was temporary because the Johnson administration saw the problem of inflation as temporary. Proposing the increase as a surcharge rather than a change in the tax rates was a way to speed passage without having Congress attach a variety of changes in the tax laws. The surcharge was enacted in June of 1968 and expired in mid 1969.

a) What did the traditional consumption function predict would happen to consumption as a result of the surcharge? To savings? To the ratio of savings to consumption?

b) What did the permanent-income hypothesis predict would happen to consumption as a result of the tax? To savings? To the ratio of savings to consumption?

c) Below are data showing the ratio of personal savings to personal outlays. Years with a Roman numeral indicate quarterly data. Do the savings ratios tend to support the prediction of the traditional consumption function or of the permanent-income hypothesis?

Period	S/C	Period	S/C
1965	6.4%	1968 IV	6.6
1966	6.8	1969 I	5.7
1967	8.0	1969 II	5.6
1968 I	7.7	1969 III	7.0
1968 II	8.2	1969 IV	7.0
1968 III	6.4	1970	8.5

Source: *1971 Business Statistics* (Biennial Supplement to *The Survey of Current Business*, Dept. of Commerce, Bureau of Economic Analysis

4) In the late 1930s and early 1940s, several economists surveyed businessmen and found that the businessmen did not consider interest rates an important factor in determining investment.

a) Explain why this could lead those using ISLM to conclude that monetary policy was not important. (Hint: trace the sequence from a change in money to a change in spending.)

b) Even if businesses paid no attention at all to interest rates, can one conclude that investment is unresponsive to them? (Hint: investment is made up of what three parts?)

c) In the period in which the survey was conducted, interest rates had shown only minor fluctuations, while income had fluctuated a great deal. Do you think their responses would have been different if interest rates had fluctuated a great deal in the previous decade?

5. Use this table to answer questions a to g below:

If Income	People	Will:		Business Intends	Government
Is	Consume	Save	Pay as Taxes	to Invest	Will Spend
200	165	15	20	18	21
220	181	17	22	18	21
240	197	19	24	18	21
260	213	21	26	18	21

a. What is equilibrium income?

b. At equilibrium income, what will the deficit or surplus be?

c. Suppose that full employment occurs when income is 260. What will the full-employment deficit or surplus be?

d. If investment increases by 4, from 18 to 22, equilibrium income will increase by 20. With this change, what will the actual budget be?

e. With the change caused by the increase in investment, what will happen to the full-employment surplus or deficit?

f. Start again with the table above. Suppose that government spending increases by 4, from 21 to 25. After the model reaches equilibrium, what will the actual deficit or surplus be?

g. With government spending at 25, what will the full-employment deficit or surplus be?

h. Can anything but a change in policy affect the full-employment surplus or deficit? Explain.

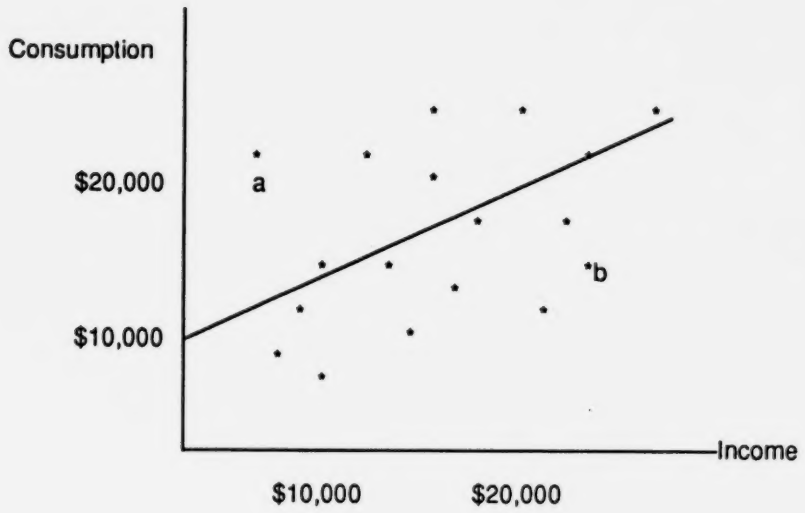
6) When economists measure the relationship between C and Y during a specific year, they do what is called a cross-section study. They look at the consumption spending and income of many people for the same time period. When consumption and income are plotted for such studies, each individual becomes a point. Thus in the graph below, point *a* may be Frances Smith. She is earning $5000 and spending $22,000. Point *b* may be Richard Ratacjzak. He is earning $25,000 and spending $14,000. Generally such studies show a lot of dispersion around the consumption line, and the consumption line has a relatively low slope and high intercept.

On the other hand, when economists look at consumption and income over time, in a time-series study, they plot the total consumption and the total income of the economy for each time period as one point. Such studies show little dispersion around the consumption line, and have a relatively high slope and low intercept. Typical results are shown in the second graph below.

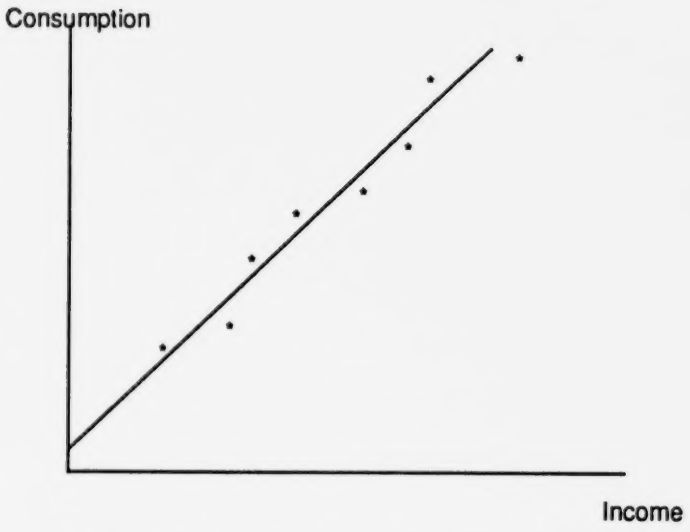
a) How can you explain the differences between consumption lines in the two graphs using the life-cycle hypothesis? (Hint: Why may Frances Smith be spending more than she is earning?)

b) How can you explain the differences between consumption lines in these graphs using the permanent-income hypothesis?

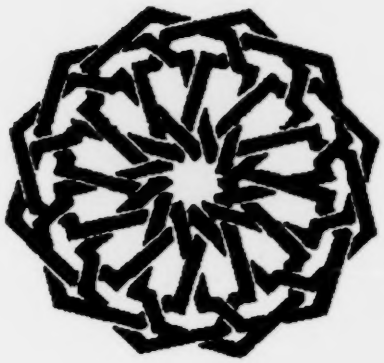
7) Many people understate dependents on their income tax withholding so that they will get a refund from the IRS in the spring of the next year. How can you argue that this behavior is reasonable?



Consumption function in a corss-section study



Consumption function in a time-series study



CHAPTER 16

THE GOVERNMENT AND MACROECONOMIC POLICY

After you finish this chapter and work the questions at the end, you should be able to:

List and describe the types of lags a policy maker faces.

Summarize why fixed and convertible exchange rates reduce the scope of monetary policy.

Summarize why floating exchange rates reduce the scope of fiscal policy.

Explain the consequences of a central bank buying its currency in order to keep the price of its currency from falling in the foreign exchange market.

Give the reason why the theory of rational expectations suggests that no model can ever accurately predict the future performance of the economy.

The idea that the government has a responsibility to take actions to prevent or cure macroeconomic problems (or to "stabilize the economy") is so widespread today that it is often not realized that this is a relatively new idea, one that developed after 1930. This chapter seeks to explain why the idea was uncommon in the 19th century, why it developed, and what its present status is.

INTERNATIONAL PAYMENTS AND LIMITS ON POLICY

The State of Indiana does not have a macroeconomic policy, nor does Illinois, Ohio, or any other state. They do have macroeconomic problems. They can have rates of inflation which differ somewhat from the rates of the United States as a whole, and they can and usually do have rates of unemployment which differ noticeably from the national average. Yet they have no macroeconomic policies to deal with these problems.

The United States government also lacked policies to deal with macroeconomic problems in the 19th century. An important reason for the lack both of state macroeconomic policy today and federal macroeconomic policy in the 19th century is that both states today and the federal government a century ago existed as part of larger economies, and were very *open* to these larger economies. State borders are today open to the movement of people and capital as well as trade, and all states share a common money which none can control. This sharing of a common money is especially important, as we noted in our discussion of the quantity theory of money and its relation to gold flows.

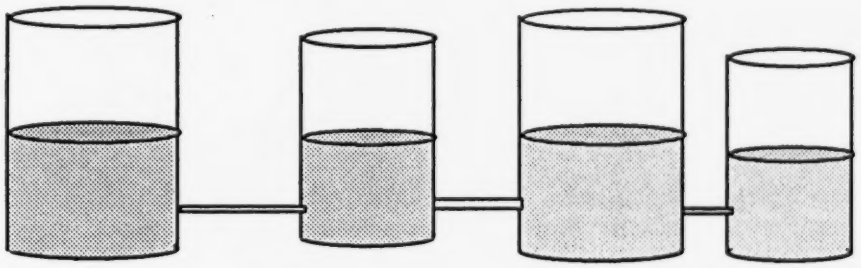
Could a state set up its own banking system? It could, but the banking system would have to issue dollars, and the state would have virtually no control over the amount of money this system could issue. With the passage of the Depository Institutions Deregulation and Monetary Control Act (DIDMCA) in 1980, all depository institutions which issue checking accounts became subject to the reserve regulations of the Federal Reserve System, though these regulations became fully effective only in 1987. Even if some banks are not subject to reserve requirements of the Federal Reserve, the monetary policy of a state would be very limited. To see why, let us consider what would have happened if a state had created its own banking system and tried to expand the state's money stock prior to the enactment of DIDMCA.

A state can charter state banks, and prior to DIDMCA it could set reserve requirements for banks which were not members of the Federal Reserve System. Suppose that a state decided to attack a localized unemployment problem with easier money. It could have reduced reserve requirements of its state banks, encouraging these banks to make more loans and in the process create more money. Then, since there would be more money in the state economy, it would seem that there should be more spending and that this increased spending should cut unemployment. But the conclusions of this last sentence do not hold in an open economy.

Spending will increase in the state as a result of the increased loans and money stock. But since the state is part of an open economy, some of that spending will be for goods and services produced in other states. Hence, much of the increase in money which was created in the state banks will quickly move out of state. In fact, within a relatively short time virtually all of the increased money will have "leaked" out of the state. The situation can be visualized in terms of Figure 1 which shows a number of tanks connected by pipes. Any increase in the water in one of them will quickly flow out into the others. Note that the size of the pipes is irrelevant for equilibrium—as long as they are connected, one cannot control the level of water in one in isolation from the rest. State economies are like these tanks, with spending replacing water.

Though monetary policy is powerless in a

Figure 16.1 When an economy is open, other economies influence it.



state economy, fiscal policy may work. The government could borrow money from the national credit market to finance public-works projects, and thus reduce its localized unemployment. Further, this spending should have a multiplier effect, and boost the local economies in which the money is spent by a multiple of the original spending. However, states do not seem to use this technique to fight unemployment. There are probably two reasons that they do not.

The first reason is that such a policy can only be a short-term policy. There are limits to how much debt local and state governments can build up. Beyond some point investors will begin to doubt the ability of the government to pay back the debt. The government can always increase taxes, but beyond some point it will not increase the revenue it obtains. People can avoid taxes because state economies have open borders—they can move. If a state's tax rates get too high relative to those of its neighbors, the state will find it difficult to attract and retain business, and it may become permanently depressed. However, this problem is a problem only of a long-term attempt to borrow to pump up the state's economy. It is not a reason to prevent the state from borrowing for short-term stabilization.

A second reason discouraging states from pursuing stabilization policies is that there can be supply-side effects. If the state tries to counter a localized unemployment, it may create problems. If the reason that an area has unemployment is that its wages are too high, a policy which cures unemployment will keep wages high and will prevent a necessary adjustment. Hence, there will be no incentive for new business to come into the area and replace the "temporary" government program. In addition, since in the open economy of the U.S. movement of people across borders is possible, a successful policy may attract the unemployed from states with no policies. A similar problem exists in the attempts of state and local governments to attack poverty through aid programs. Because there is an incentive for poor people to move to the areas which have the best programs, a program designed to aid only a few poor may end up aiding a great many.

Just as the states are limited in the policies they can pursue by the openness of the economy in which they exist, so too the federal government was limited in the late 19th century. In the last few decades of the 19th century, the United States was experiencing a slow deflation; prices were falling. This was a source of considerable political discontent, and accounts for part of the political career of one of the more colorful politicians of the era, William Jennings Bryan. The deflation could have been stopped if the United States had increased the amount of money in circulation. However, this action

would have endangered convertibility of the dollar into gold. The United States made the dollar convertible in 1879 after over a decade of trying to readjust from the rapid money creation which had accompanied the Civil War. Once it was back onto the gold standard with a dollar that was convertible into gold, higher prices in the United States would have encouraged more imports, and gold would have flowed out to pay for those imports. The United States had a choice: either it could adjust to a price level dictated by the rest of the world and the world's stock of gold, or it had to abandon the gold standard.

Abandonment was Bryan's choice. He wanted to use silver in addition to gold as a backing for money, a policy he believed would lead to "easier" money. The Democratic Party nominated him for the presidency in 1896 when he was only 36 years old, largely because of his stirring speech during the debate over the party platform. He claimed that the people of the country were being crucified on a "cross of gold."

Bryan, despite three tries, never was elected to the presidency and the country continued with the dollar linked to gold until 1933. The issue was defused in the 1890s by the opening of new gold fields in Australia and Alaska, and the discovery of the cyanide method of extracting gold from ores.

From 1879 until the outbreak of World War I, the United States was part of an open world economy, though that economy was not as open as the national economy in which the fifty states exist. Nations had restrictions on movements of people, capital, and goods, and each nation had its own monetary system. However, the monetary system of each nation was linked to gold. For example, the United States promised to buy and sell gold for dollars at the rate of one ounce for $20.67 and Great Britain promised to buy and sell its currency at a rate of one ounce of gold for 77 shillings and 10 1/2 pence. After an adjustment for purity (the ounce of U.S. gold was defined as 90% fine while that of Great Britain as 91.7% fine), the value of a British pound was $4.865. Though one might call money by different names in the U.S. and U.K., they were linked together by their common link to gold, and one can think of gold as the universal money.

The monetary policy of any country on the gold standard was limited by the "rules of the game," or the actions necessary to keep each currency convertible into gold. Because this system was a bit less open than the economy of which the states are a part, some temporary monetary measures were possible. The government could temporarily increase or decrease money stock, and it would take some time before the gold flows needed to offset these actions would happen. Or if a country had an inflow of gold, it could **sterilize** it by using tax proceeds to buy up the gold and thus not let it increase the money stock. Sterilizing gold inflows (or outflows) was considered a violation of the rules of the game, and was considered by other countries to be irresponsible.

As the the Second World War came to an end, delegates from 44 nations met in Bretton Woods, New Hampshire to redesign the international financial system. The Bretton Woods agreement of 1944 attempted to return to fixed exchange rates and to reduce the barriers to trade. The agreement in effect put the world on a dollar standard: the United States linked its currency to gold, and the other nations then fixed their currencies to the dollar.

The dollar was the only currency linked directly to gold because the United States had accumulated almost all of the world's gold used for monetary purposes. But throughout the 1950s and 1960s the U.S. lost gold, and by the end of 1967 it had only one half of what it had had in mid-1949. The system was in trouble because everyone came to realize that the U.S. could continue linking the dollar to gold only if no nation tested the link. The system was patched up several times before collapsing completely in 1972 when the United States cut all links between the dollar and gold. Since that time the U.S. and most other industrialized nations have let their currencies float.

The breakdown of the Bretton Woods agreement was in large part caused by the

refusal of the United States and other nations to sacrifice domestic macroeconomic policy for the goal of maintaining the international financial system. For example, when the U.S. used monetary policy to combat unemployment, it expanded its economy, increasing spending. Some of this spending was for products made in foreign countries. Dollars flowed out of the U.S. into foreign countries. The people in these countries were happy with the amounts they had been buying from the U.S., so they did not want to spend these extra dollars for U.S. goods. These excess dollars should have caused the value of the dollar to fall in the foreign exchange market, but it did not because foreign central banks had fixed the price of the dollar in terms of their currencies. The foreign banks would keep the price constant by buying the excess dollars in the market, and in the process they would create additional amounts of their own currency to pay for them. This transaction had the same effect as an open market purchase by a central bank—it tended to increase the amount of money.

The foreign central bank had three options after it bought the extra dollars. First, it could return the dollars to the United States and ask for payment in gold. By the rules of the game, the United States should have been forced to reduce its money stock when asked for payment of gold, but this often was not politically feasible in the U.S. By the 1960s other countries realized that if they demanded gold, they would force the U.S. off gold.

Second, a central bank could sterilize the transactions by selling other assets, and thus keep its money stock steady, but this would not correct the problem and the inflow of dollars would continue. Third, a central bank could let the transaction expand its money stock. As a result there would be increased spending in the nation, and some of the additional spending would increase imports, getting rid of the excess dollars. But if it chose this third option, it lost control of its domestic monetary policy.

The mechanics of a fixed exchange rate system, and the rationale for why it would limit monetary policy were understood by the mid 18th century when David Hume explained them. Further, you may recall that the quantity theory of money was originally developed as a way of explaining how gold flowed from country to country. Thus, no one should have been surprised when the fixed-exchange-rate system broke down; the breakdown was inevitable once countries decided that they wanted to have domestic monetary policy. If a country wanted to use the world money, it was also required to have the world's price level. By going to floating rates, the world went to a system that partially closed each economy, at least for monetary policy.

Because Germany had a floating exchange rate, its monstrous inflation in 1923 did not spill over its borders to France or Britain. Rather as the value of the mark dropped in terms of goods, it also dropped in terms of the French franc and the British pound. For a citizen of France buying things from Germany, the effect of the inflation was hardly noticeable because the fall in the franc price of marks almost exactly offset the rise in the mark price of goods. Thus, a floating exchange rate system works very well when the countries of the world are pursuing policies which lead to a variety of rates of inflation, and that generally has been when it has been used.

Though a floating rate frees monetary policy, it reduces the effectiveness of fiscal policy. To see this, consider the case in which the government of country A runs a bigger deficit to spur spending, and it finances this deficit by borrowing. The increased borrowing raises the interest rates in the financial market of A. Unless country A has barriers on the flows of money, its financial markets are part of the larger world financial market. Hence, the higher interest rates will attract foreign funds eager to take advantage of the new higher interest rates. But if foreigners are using their foreign exchange to buy A's debt, they cannot use that exchange to buy its products. There will be a rationing problem—who will get the foreign exchange, the people lending in country A's financial mar-

kets or the people buying products from A. Under floating rates, the rationing is done by price. The price of country A's money will rise in terms of other currencies. As a result, people in A will buy more from abroad, thus providing more funds to the foreign exchange market, and they will be able to sell less abroad. The higher exchange rate will cut exports of A, and thus jobs will be lost. Since the original purpose of the government deficit was to create jobs, it is partially frustrated with a system of floating rates. Crowding out is more serious because now higher interest rates not only cut investment, but they cut exports as well.

Finally, a floating exchange rate system is not the only way a nation can maintain an independent monetary policy. Another way is to fix the exchange rate and then outlaw the market. This system, which is especially popular in less-developed nations, was briefly explained in Chapter 8.

STABILIZATION POLICY

Prior to the 1930s economists and others had often suggested ways for the government to perform its tasks. Most believed that, left to itself, a market economy would perform well, and thus they generally suggested ways that they thought would insure that the government or the central bank would not *destabilize* the economy.

The Depression of the 1930s caused economists to reevaluate their prior beliefs about the government's role. As a result of Keynes' *General Theory*, most economists came to believe that the economy was inherently unstable, and that this instability was the source of the Great Depression. The impact of the income-expenditure model on economists' thinking is hard to exaggerate. Its impact is symbolized by a new generation of textbooks after World War II in which macroeconomics not only has expanded to roughly one half of the text, but is introduced *before* the traditional tools of microeconomics.

The development of the computer in the 1950s and 1960s increased the prestige of income-expenditure models. These models were easily expanded into very large models with hundreds or even thousands of equations. The models cost millions of dollars to construct and involved the work of talented economists using sophisticated mathematical and statistical tools. Using their basic idea of trade-offs, economists reasoned that one could buy more accuracy in a model only by sacrificing something good, simplicity. Since the models were complex, sometimes so complex that no one person fully understood them, they were expected to be accurate. Those developing the models promised to make economic prediction and forecasting more accurate and "scientific."

The high tide of stabilization policy occurred in the 1960s. At its height, many economists talked of "fine tuning" the economy. They believed that progress in macroeconomics had rendered recessions obsolete if politicians used the best economic advice available. This view was reinforced by over eight years, from early 1961 until late 1969, without a recession (though there was a near miss in 1966).

Though a few economists remained pessimistic about the possibilities of fine tuning, it was not the logic of their arguments which changed the way economists thought about stabilization policy. It was the events of the 1970s which did that. In the 1970s the U.S. economy found itself with serious recessions, high unemployment, and much higher rates of inflation than it had had during the previous two decades. These results were not a consequence of economists being ignored; they had been involved in policy decisions throughout the period.

As a result of the disappointing performance of the U.S. economy in the 1970s, economists have re-examined the problems of stabilization policy. They have found that there are serious obstacles to successful macroeconomic policy. Economic consensus has moved away from the idea that fine tuning is possible, and a significant minority has returned to a pre-Keynesian position that the major focus of government policy should be, "First, do no harm."

The issue of stabilization policy can be viewed in terms of the concept of feedback. Those who distrust an active role of the government believe that the economy has strong negative feedback impulses which tend to correct deviations. Though the economy will have problems of inflation and unemployment, these problems will be contained, and with some time lag, eliminated. Those who hold this view fear that active government policy may interfere with normal feedback responses and destabilize rather than stabilize.

Those who advocate an active role for the government, on the other hand, believe that the negative feedback impulses are weak or absent. Without government action, any problem of inflation or unemployment will persist.

It is easy to see how the Great Depression influenced the beliefs of those who advocate an active role for the government. The negative feedback responses seem to be working in the early 1930s because prices and wages fell as unemployment rose. But this feedback did not contain the fall; the decline lasted more than three years.

The only possible position for those who dislike an active policy is to argue that the Great Depression was a result of policy error. Milton Friedman and Anna Schwartz in fact aggressively argued this position in their *Monetary History*. They argue that the Federal Reserve established a policy response which allowed bank reserves, and thus money stock, to decline as business activity declined. The Fed unintentionally set up a system of positive feedback in the monetary sector which overrode the negative feedback responses in the rest of the economy. In this view the instability obvious in the Great Depression (and also, incidentally, in the Great Inflation in Germany) was the result of a particular set of government policy responses, not something inherent in the economic system.

THE PROBLEM OF LAGS

When Gerald Ford became president, he and his economic advisors fixed on inflation as the number one economic problem facing the nation. In a highly publicized search for solutions, President Ford hosted a two day "summit" meeting of academic, political, and private sector leaders early in October of 1974. Shortly after this meeting, the president proposed a 5% income tax surcharge on some individuals and corporations as a measure to curb excess demand and pull down inflation. However, in the next few months the unemployment rate soared, and in his State of The Union message in January of 1975, the president had abandoned his proposed tax increase in favor of a $15 billion tax cut to fight recession.

The sudden switch in proposed policy would have made the Ford administration look good if the economy had peaked between October of 1974 and January of 1975. Then it could have boasted that they had quickly changed policy recommendations when conditions changed. Unfortunately the dates which the National Bureau of Economic Research gives to the peaks and troughs of business activity show that the Ford administration had its timing wrong. The Bureau dates the peak of business activity in December of *1973*, and the trough in November of 1974. Thus, the Ford Administration was gearing up to fight inflation just as the recession was about to hit bottom, and began preparing its fight against the recession a few months after it had already ended.

The Ford Administration suffered from a dramatic case of a common problem, the problem of **recognition lag**. Usually policy makers need several months to recognize that a problem is developing. Though many statistics are available fairly quickly, sometimes within a few weeks, revisions months later can change the message which they give. Also, there is a lot of random movement in many of the series, so that an one or two

month movement may not indicate that anything important is happening. Only when several months have passed can one see any patterns which are developing.

After a problem is recognized, policy makers need time to decide what to do, a time period called the **decision lag**. They then must enact their decision, which can also take time, the **implementation** or **action lag**.

These lags are short for monetary policy because a simple majority of the FOMC can change policy in a telephone conference and open-market operations can begin within hours of a decision. The length of these lags for fiscal policy, however, is substantial. Decisions about which spending programs or taxes should be changed are made in the White House and are submitted to Congress. Legislation must go through committees and hearings, and pass both houses of Congress. If there are differences, the bills go to a conference committee which reconciles differences and then this compromise bill must be voted on again. After the president signs the legislation, time may elapse before any change occurs in the amount of money spent or taxes collected. If the time lag for deciding and enacting fiscal policy is less than six months, the system has worked very fast.

Once the policy has begun, it does not affect peoples' behavior immediately. A change in taxes, for example, will affect consumption, but our discussion of the permanent-income hypothesis suggested that there would be lags involved before there was a sizable change. Similarly, an increase in money stock will not immediately affect spending. The increase in money stock will throw the market for money balances into disequilibrium. As people adjust in this market, they will throw other markets, such as financial markets out of equilibrium. As these markets adjust, the goods market will be thrown out of equilibrium. Only with time, which may be measured in years, will full adjustment to these disequilibrium situations take place. We can call this time required for the actions to change behavior the **take-effect** lag.

The existence of lags may mean that by the time policy has its full effect, the problem with which it was meant to deal may have disappeared. Figure 2 illustrates with the dotted line a path which the economy might follow in the absence of any government actions. This path does not coincide with the

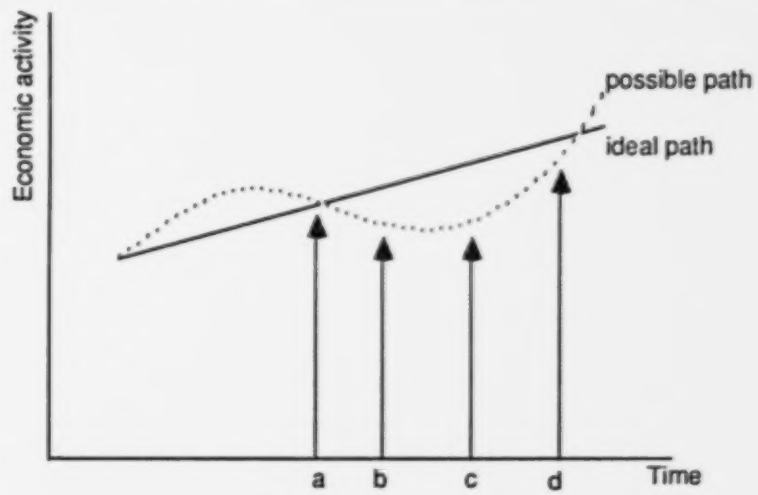


Figure 16.2 Lags make government less reliable as a stabilizer

best possible path, or the ideal path, of the economy. If economists could fine-tune the economy, they would make the economy follow the ideal path. But if they actually try to fine tune, they may find that they do not recognize the problem until time *b* and do not take action until time *c*. The major impact of their action may not show up in the economy until time *d*, by which time the problem has changed. It is possible that attempts to stabilize the economy can, because of the problem of lags, make the economy less stable rather than more stable.

Recognition, decision, and take-effect lags occur in many decision-making processes, not just in macroeconomic policy. Businesses have these lags in many different places. For example, automobile manufacturers occasionally discover that slow sales have allowed inventories to rise too high. Car sales fluctuate a lot from day to day and week to week, so that car manufacturers cannot discover that they have a problem on the first day it begins, but only after several weeks or months of slow sales. Once they decide that they have a problem they must decide how to solve it. They can cut their work force, advertise more, cut prices, find a sales promotion, or some combination of these. Once they decide what to do, it takes a while for unwanted inventory to be sold.

OTHER STABILIZATION PROBLEMS

Time lags are not the only reason that stabilization policy is difficult. In addition, economists only partially understand how economies actually work, and thus they cannot predict precisely what the effects of any government actions will be. Also, public-choice theory suggests that decision makers should be assumed to pursue their self-interest, and that what is best for them may not be ideal for the rest of us.

We can evaluate how well economists understand the economy by looking at their predictions. Economic forecasters specialize in trying to predict what will happen in the future, and generally sell their predictions to

TABLE 1
ITS HARD TO FORECAST THE FUTURE

	REAL GNP		GNP DEFLATOR	
YEAR	ACTUAL	PREDICTED	ACTUAL	PREDICTED
1971	4.7	3.8	4.7	3.6
1972	7.0	5.6	4.3	3.2
1973	4.3	6.0	7.0	3.3
1974	-2.7	1.2	10.1	5.5
1975	2.2	-0.6	7.7	7.1
1976	4.4	6.0	4.7	5.4
1977	5.8	5.0	6.1	5.7
1978	5.3	4.2	8.5	5.9
1979	1.7	1.5	8.1	7.1
1980	-0.3	-0.8	9.8	8.2
1981	0.9	2.4	8.9	9.1
1982	-1.7	2.8	4.4	7.1
1983	6.1	3.9	4.1	5.4
1984(prelim.)	5.6	4.3	3.5	4.7

Source: *Economic Review*, Federal Reserve Bank of Richmond, Jan/Feb 1985, p. 26.

businesses and others who believe that the information will be useful to them. The Federal Reserve Bank of Richmond has tracked a number of forecasts, and Table 1 shows a summary of results. The values in the "predicted" column are the median or middle forecasts of the forecasts which the Reserve Bank of Richmond surveyed.

The average forecast obviously misses a large amount of the variation, especially of the rate of inflation. None of the individual forecasts, some of which are generated with the aid of the large and expensive computerized models, are substantially better than the average. Though at one time economists once thought that they would, with enough time and effort, build models that would be highly accurate, many have now begun to doubt if such models are possible.

One reason economists may not be able to predict well is that the effects of policy depend on people's expectations. The last chapter began discussing implications of this idea in the section "Policy Rules." Because people's expectations depend partially on past policies, expectations are always changing.

To illustrate why expectations can be important, consider how a profit-maximizing business will react if it believes that price controls may be imposed in the future. It will be ready to raise prices but hesitate to cut them because if controls are imposed, raising them again will be very difficult. If it gets caught with prices high when controls are imposed, the business will not be hurt. But if it gets caught with prices down, it will be hurt. In making pricing decisions, the firm will have to consider these factors in addition to other factors in determining prices. As a result, a business which normally reduces prices in periods of recession may hesitate to do so if it fears price controls.

One might argue at this point that expectations should not matter, since businesses can always raise prices once it becomes evident that controls will be imposed. However, the government recognizes this possibility as well and, as a result, controls often have a retroactive feature in them—prices are fixed at values they had several months before the legislation takes effect, or at some average value of the previous period. Hence, the firm cannot be sure that lower prices now may not affect its ability to charge higher prices in the future if controls are a possibility.

The idea that expectations matter has many implications. It suggests that people will react differently to an anti-inflation policy if they believe that policy makers will stick to it than if they believe that policy makers will give up when unemployment rises. It suggests that people will react differently to a policy when they expect it than when they do not. And it implies that because expectations can change quickly and because expectations are difficult or impossible to include in statistical models of the economy, these models, no matter how complex, will not always give reliable forecasts.

A final problem in stabilization policy is that good economic policy only is enacted when it is also good political policy. A policy which looks wonderful to an economist may not look wonderful to a politician trying to stay in office. Economists have had a tendency to neglect this problem by assuming that economic policy makers are different from the rest of us. Self-interest motivates ordinary people but, by hidden assumption, the desire to serve the public good motivates policy makers.

Once one lets policy makers become interested in their own self-interest, two complications arise. First, politicians want to win elections. Incumbents do not win elections if economic conditions are bad and the electorate holds them responsible (which in the United States is usually true of the president's party). Further, some policies have short-run effects which are desirable but harmful long-run effects. Other policies have harmful short-run effects but desirable long-run effects. It seems reasonable for politicians to follow policies with good long-run effects immediately after an election and policies with good short-run effects right before elections. If they do, there should be movements in the economy which correspond to the election cycle. Economists have searched for

TABLE 2
HOW THE EXCHANGE RATE SYSTEM INFLUENCES GOVERNMENT POLICY

Government Actions	Type of Exchange Rate: Floating	Fixed and Convertible
Monetary Actions	not offset	largely offset by money flows
Fiscal Actions	largely offset by changes in net exports	not offset

these patterns, but have not been able to find them consistently in the data. Perhaps decision making is too split up in democracies to permit such patterns, or perhaps politicians and their economic advisors do not know enough about the effects of their policies to be able to successfully work this strategy

Second, some economists have argued that politicians tend to misuse economic theories about stabilization. One of the conclusions from Keynesian theory is that a government deficit can be, in times of recession, desirable. Politicians, however, like deficits all the time. They get votes by spending and lose votes by taxing. Hence they will use, or misuse, any theory which will justify a deficit. According to this argument, politicians will use stabilization arguments to expand the deficit during recessions. They will be reluctant to admit that a recession has ended, or they will foresee threats of future recessions because the stabilization theory says the deficit should be eliminated in periods of boom. This argument suggests that failure to include a theory of politician behavior in discussions of stabilization policy has contributed to the persistent deficit spending which many democracies have encountered.

SUMMARY

This chapter looked at problems a government may have if it attempts to improve the macroeconomic performance of the economy. The impact of monetary and fiscal actions will depend in part on whether the exchange rate is fixed or floating. Table 2 summarizes the conclusions we reached. The chapter also discussed three difficulties a society will have if it wants the government to attempt to improve macroeconomic performance: the existence of lags, uncertainty about how the economy works and thus about the exact effects of any government action, and the possibility that incentives may exist which encourage policy makers to pursue policies which cause more harm than good.

QUESTIONS

1. Why did the discoveries of gold and the cyanide method of extracting gold from ores stop the deflation in the late 19th century?

2. Suppose the dollar buys four German marks, in Germany a mark buys one pound of sugar, and in the United States ten cents buys a pound of sugar. How could you make a profit from this structure of prices if there are no restrictions on trade and transport

costs are negligible? In a system of fixed exchange rates, what prices will change to eliminate profits? Why will it change? In a system of floating exchange rates, another price can change which will eliminate profits. What is it? If all change is in this price, what will it change to?

3. As a result of the development of North Sea oil fields, Britain switched from importing oil in the 1970s to exporting oil in the 1980s. During the entire period the British pound was floating.

a) What effect should the change in oil trade have had on the price of British pounds in the foreign exchange market?

b) As a result of this change in exchange rate, should British consumers decide to import more or less? Should it have become easier or harder for British businesses to export?

c) If wages are flexible, what would the effect of these changes in part b have been? If wages are not flexible, what are the likely effects on employment of these changes?

4. Not only do government and business have problems of lags in problem solving, but so do students. For example, suppose that Joe Puma takes a course in advanced economics and that he needs at least a B in the course to maintain his academic scholarship. Suppose also that the time and effort he devotes to this course are not enough for him to obtain a B.

a. How will he discover that he has a problem?

b. List as many options as you can that he has to correct his problem.

c. Pick the option you think is best. How much time will be needed before this solution will correct his problem?

5. Describe the recognition, decision, and take-effect lags for the following: alcoholism, drug addiction, getting lost in the woods, getting lost in a course, making a bad investment, and taking an unsuitable job.

6. Answer the questions below using these balance sheets.

(amts in billions of $s)

central bank		commercial banks	
assets	liab + nw	assets	liab + nw
holdings of foreign exchange 10	member bank reserves 20	reserves 20	deposits of foreigners 5
other assets 100	paper money 80	loans 180	other deposits 190
	other 10		other 5

a. Foreigners decide that they want to hold only $4 billion instead of the $5 billion which they are holding. They sell those dollars to the central bank in exchange for foreign exchange. How does this transaction change the balance sheets above?

b. Suppose that the required reserve ratio is 10%. How does this transaction affect the ability of commercial banks to create money?

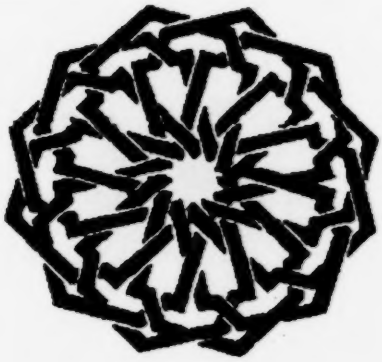
c. Will this transaction resemble an open-market purchase or an open-market sale in terms of its effects on money stock?

7. Lags affect many adjustment processes, not just those in macroeconomics. One that is quite interesting and often misunderstood involves population growth.

a) Suppose a hohm is a mythical beast that lives four years. It reproduces only in its second year, and dies in its fourth. Start with a population of 200 young hohms which have a fertility rate of three. This fertility rate says that each female produces three offspring (or each hohm produces 1.5 offspring if the population is half female, which we will assume). Thus in the second generation there will be 300 hohms, and the total population will rise to 500 (since none of the original hohms are old enough to die). Complete the table below assuming that the fertility rate remains three until the seventh period, when it drops by one half, to 1.5. For how many generations after the drop in the fertility rate will population continue to rise?

Generation	Number Born	Number who die	Total Population
1	200	0	200
2	300	0	500
3	450	0	
4		200	
5		300	
6		450	3655
7			
8			
9			
10	481		

b) The United States had a fertility rate of about 1.8 during the late 1970s and 1980s. A fertility rate of 2.1 is considered necessary for replacement. Yet throughout this period, U.S. population grew substantially, and would have grown even without an immigration. How can population grow if the fertility rate is below the replacement level? What will happen in the long run to U.S. population if the fertility rate stays at 1.8?



CHAPTER 17

WHAT DO WE REALLY KNOW ABOUT MACROECONOMICS?

After you finish this chapter and work the questions at the end, you should be able to:

List six frameworks that can be used to begin macroeconomic analysis.

Chapter 5 introduced macroeconomics by looking at two cases of economic disasters, the Great Inflation of Germany in 1922-23 and the Great Depression of the United States in the 1930s. Since then we have asked how we could explain these happenings. In looking at how economists try to make sense of the problems of macroeconomics, we have encountered areas of significant disagreement among economists.

One reason for this disagreement is that there remains controversy about which framework should be used in macroeconomic analysis. The past chapters have explained six different frameworks in which we can search for answers. All seem to have a kernel or two of truth to them, but none seems to be completely satisfactory all by itself. This chapter reviews those frameworks and the behaviors they lead us to examine. It also highlights some areas of substantial (but not unanimous) agreement, and tries to show what these agreements tell us about those two disasters which introduced you to macroeconomics

FRAMEWORKS OF ANALYSIS

The framework which dominated introductory economics until recently has been the simple Keynesian framework which we saw in the income-expenditure model. This framework suggests that the way to understand total spending is to divide the total into parts and then study the parts. When one understands the parts—consumption, investment, government spending, and net exports—one should understand the whole.

The simple Keynesian framework makes sense of the multiplier process and the notion of fiscal policy, but it has severe limitations. It does not analyze changes in price level well, and it does not mesh well with the approach taken in microeconomics. Microeconomics assumes that people's actions are motivated by a desire to achieve goals, but there is no evidence of goal seeking in the Keynesian framework.

The quantity-theory framework is older than the Keynesian framework, and has seen a revival since the 1960s. It suggests that we look at all transactions as involving the purchase or sale of money. When you go to the store and buy potato chips, you think of that transaction as the buying of potato chips. The quantity theory tells you to think of it as a transaction in which you sell money. You sell money, and in order to buy your money, the store gives you potato chips.

Once we start thinking of all transactions as the purchase and sale of money, we can ask what will happen if the amount of money available to buy and sell changes. If it decreases, we expect its value to increase, just as when there are fewer apples to buy and sell, we expect the price of apples to increase. When the value of money increases, then a fixed amount of money buys more, which can happen only if prices of goods and services fall. The quantity theory argues that changes in the amount of money affect the volume and value of transactions which involve money.

If changes in the amount of money are important, then we have to ask what sorts of changes affect the amount of money in circulation. This question takes us to the banking system, for in modern economies money is bank debt. It also leads us to discuss monetary policy, for in modern economies governments can control the money creating ability of banks.

A limitations of the simple quantity theory framework is that it does not explain output fluctuations. These fluctuations are important in modern economies.

A third framework is a merger of the simple Keynesian framework and the quantity theory framework. The ISLM framework expands both frameworks and lets us talk about both fiscal and monetary policy. It has been a very popular framework among economists, but increasingly economists have begun to worry about what it leaves out.

The business-cycle framework is a fourth framework we have discussed. It asks us to appreciate disequilibrium. It suggests that

we should not always try to analyze the economy in terms of equilibrium positions. The economy is like a rocking chair. If the chair or the economy is set rocking, readjusting to equilibrium takes a long time. In contrast, the ISLM framework encourages us to analyze in terms of equilibrium positions.

A fifth framework is the aggregate-supply aggregate-demand framework. This framework attempts to expand the ISLM framework, which is purely demand driven, to include production-side problems. If, for example, a the supply of a key resource suddenly drops, what will happen to the economy? ISLM does not tell us. By including production-side problems, economists can begin talking about the effects of flexible prices as opposed to sticky prices, and in turn can discuss a whole series of questions that are difficult to discuss in other frameworks.

A final framework is the one which we began with, the general equilibrium framework. It encourages us to see the economy as a set of interdependent markets. A change in one market can affect other markets, even those which seems totally unrelated. This framework has firm roots in microeconomics, and lets us see why aggregation is necessary. However, it is not specific enough by itself to answer the questions of macroeconomics.

Because each of these frameworks can give us insights, we have looked at them all. Perhaps someday a new framework will be developed that will simplify the study of macroeconomics by giving us all the important insights of these six separate but not necessarily contradictory frameworks. That day does not seem to be near at hand.

Much of the past chapters have been spent looking at people's actions that make these frameworks work. There are five classes of behaviors that have been especially emphasized.

First, we have looked at people's decision to spend or save. This decision is important in the income-expenditure approach and any framework built on it. We argued that people want both a high standard of living, and one that does not vary much over time. The life-cycle and the permanent income hypotheses gave us foundations for out conclusions.

Second, we looked at two areas of portfolio choice, or how people structure their balance sheets. Portfolio choice is important in any approach which argues that the amount of money matters. People make decisions about how large they want their cash balances, which affects the velocity of circulation. We argued that the better money served as a store of wealth, the more cash people would want to hold. Banks also make portfolio choices, and their decisions can create or destroy money.

Third, we looked at investment spending, a form of behavior that is important in income-expenditure approaches, and has also been a key ingredient in some business-cycle theories. We argued that the benefits of additional capital rise when business sales rise, and therefore the amount of investment should be sensitive to changes in spending. This idea was called the accelerator. We also argued that investment should be sensitive to the real interest rate. This was a key idea in developing the ISLM model.

Fourth, we have looked at how policy makers respond to economic conditions. Just as businesses and consumers respond in regular and systematic ways to economic conditions, so do policy makers. We know that when the economy enters a recession, policymakers will try to ease policy, and when inflation is seen as a serious problem, they will try to tighten policy. By looking at policy rules, we can talk about the importance of lags and information. We can talk about the role of the exchange rate of types of policy. We can look at the difficulties of measuring policy. And finally, we can ask how people's expectations of government policy will affect their behavior.

Finally, we have looked at how people adjust prices to different economic conditions. The size of output fluctuations seems to depend a great deal on whether prices are flexible or sticky. If they are sticky, we need to explain why they are, and we attempted to do that by arguing that changing price could

be costly, or it could be a result of poor information or of information that is not shared by all.

MONEY IS IMPORTANT

One of the most important shifts in macroeconomics since 1960 has been in the way economists view the importance of money. In the 1950s there was a sizable contingent of economists who believed that changes in money stock had little effect on spending; by the 1980s there was a sizable contingent who believed that little else mattered. An important reason for this shift was the realization that both the Great Inflation and the Great Depression could be explained in terms of changes in money stock.

The dominant explanation, and perhaps the only explanation which economists consider reasonable, of the Great Inflation was that it was the result of excessive money creation by the German government. There was a tremendous increase in the amount of money during the period, and the totals at the end of the inflation are beyond comprehension. Bresciani Turoni states that on November 15, 1923 the amount of paper marks had reached 92,800,000,000,000,000,000.[1] Phillip Cagan estimates that bank deposits less cash reserves were 1,959,000,000,000,000,000,000 marks in 1923, but three years earlier there had been ten zeros less on this statistic.[2] Yet the rapid increase in money was not as great as the increase in spending. Velocity increased about ten times from the start of the inflation to its peak in November, 1923.

If one had told a German in 1923 that his inflation was caused by too much money, he probably would have replied that, on the contrary, there was a shortage of money. There was such a great shortage, in fact, that businesses issued illegal money called *Notgeld* or Need Money. (The German word *Not* means *need*, not *not*. Phillip Cagan estimates that the amount of this money did not exceed 192 quintillion marks.) If you would have told the experts in the Reichsbank that they were issuing too much money, they would have told you that this could not be so. The real money stock, or the amount of money divided by the price level, had fallen.

To evaluate these objections that Germany had too little money, one must remember the distinction between equilibrium and adjustment. Most monetary theorists believe that if the amount of money doubles, price will double in equilibrium. This means that the real amount of money—the purchasing power that people hold—will remain constant. But this is only an equilibrium condition; it does not need to hold in the adjustment process, and none of the prominent monetary theorists has held that it will. If the adjustment process involves inflation, then the velocity of money should increase and real money holdings should decrease. Inflation lessens the usefulness of money as a store of value, and the more serious the inflation, the poorer is money as a store of value. As money becomes a poorer store of value, people should try to switch into other assets and hold less of it.

If velocity increases, as monetary theorists say it will if inflation accelerates, then real money balances *must* fall if output remains constant. The mathematics of the equation of exchange insists on this conclusion. One can see this by rewriting the equation of exchange in the following form:

$$M/P = Q/V.$$

M/P is the real money stock. If Q was roughly constant and V increased by ten times, the real money stock must have been about ten times smaller than it was at the beginning of German hyperinflation.

Today almost all economists believe that

1. *The Economics of Inflation: A Study of Currency Depreciation in Post-War Germany*, p 23.

2. "The Monetary Dynamics of Hyperinflation", in *Studies in the Quantity Theory of Money*, Milton Friedman, editor (University of Chicago Press, 1956), pp. 101, 104.

money played some role in causing the Great Depression, though they disagree on how big its role was. In Chapter 9 you saw that there was a correspondence between the amount of money in circulation and GNP. Chapter 15 presented an argument of Peter Temin, who believes that the drop in interest rates from 1929 to 1931 indicates that monetary forces were off stage during this period, and may not have had much of a role in the rest of the story either. Temin supports his interest-rate argument by noting that prices fell by as much as money did between 1929 and 1931, so real money did not decline. As a result, he states that monetary forces could not have caused the level of income to fall.[3]

Recall in our discussion of the ISLM model, we argued that the demand for money should be stated in terms of purchasing power, or real money. Temin is using this same argument here. If real money did not change, then the LM curve should not have shifted. Note that the same logic can be used to argue that monetary forces did not cause the Great Inflation. In fact, since real money declined between 1921 and 1923, the LM curve should have shifted to the left, which suggests that monetary policy in Germany was restrictive, and rather than causing the inflation, it kept it from being even worse. A problem with Temin's real-money argument is that the demand for money (and hence velocity) should be sensitive to the *rate of change* in prices. Because prices were falling between 1929 and 1931, money appeared to be a better store of value than it had looked a couple of years earlier. A constant real money will indicate no changes are originating from the monetary sector *only if* the rate of change in price level remains constant.

3. Temin, Did Monetary Forces Cause the Great Depression, p. 170.

EXPECTATIONS AFFECT BEHAVIOR

Repeatedly we have discussed cases in which people's behavior has depended on expectations: people's consumption depends on expected income; businesses make investment decisions based on what they expect the future demand for their products to be; workers and employers make decisions on wage rates based on what they expect the rate of inflation to be. In addition to these examples, expectations played special roles in the Great Depression and the Great Inflation.

A major reason money stock declined as much as it did between 1929 and 1933 was that the public's faith in the banking system was shaken, and there were three periods in which there were runs on the banks, in October 1930, March 1931, and January 1933. When a run on a bank occurs, people try to withdraw their deposits, asking the bank for currency. Expectations about banks closing tend to be self-fulfilling. A bank holds only a small part of its assets in currency and other liquid forms, and can pay off on short notice only a small part of its liabilities. If enough people fear that a bank will close, it will close, whether or not it is sound. Once one bank closes, people become concerned about other banks. Hence, the failure of an unsound bank can trigger runs on sound banks, causing them to close (which may be only temporary), thereby causing runs on still more banks.

When people lose faith in the soundness of banks and withdraw currency, their actions, unless offset by actions of the central bank, reduce money stock. The reasons for this reduction were a topic of Chapter 10. In the early 1930s the Federal Reserve did not act to offset the effects of the currency drain on the banks, and much of the decline in money stock resulted from the public's substitution of currency for bank deposits. The process illustrates an important positive feedback relationship. The withdrawal of

deposits from banks reduced money stock, which caused income to drop, the drop in income caused bankruptcies and made people question whether or not their banks were still sound. In their concern they withdrew more money from banks, which tended to cause a further reduction in money, etc.

Expectations—and luck—played an important role in stopping Germany's hyperinflation. Hjalmar Schacht, who we met very briefly in Chapter 5, became Currency Commissioner in November of 1923. He immediately introduced a new currency, the rentenmark. A strike of Berlin printers made rentenmarks scarce. People waited in line to convert their old marks into rentenmarks—they desired to get out of marks into anything that might retain value. Because people thought rentenmarks were scarce and expected them to keep their value, people hoarded them, which gave rentenmarks a much lower velocity of circulation than the old marks had. The government was able to issue them at a fairly rapid rate without a renewal of inflation, giving it time to get its fiscal house in order. (The government had relied heavily on borrowing to finance World War I, believing that the war would be short and that Germany would win and be able to force its opponents to pay for the war. It did not raise taxes, and continued to rely on borrowing after the war. In fiscal year 1920-21, only about 40% of government expenditures were raised through taxes.) Germans were ready and eager for a stable money, and wanted to believe that the rentenmark would be such a money. If they had not believed that it would retain value, the Great Inflation would have continued.

Though all economists believe that expectations matter, how they matter and which expectations matter remain subject to controversy. For example, the Keynesian emphasis on the role of autonomous investment as a cause of fluctuations in business activity is based on expectations. Keynes thought expectations were sometimes erratic and not always explainable. He referred to the "animal spirits" of businessmen, and believed that speculative binges (see Chapter 7) were important not only in the stock market but in investment decisions. Thus, if for unexplainable reasons businessmen become optimistic, investment will rise, and pull business activity with it.

Other economists see less importance in autonomous shifts in investment because they see businessmen not as speculative investors moved by erratic expectations, but as cold-hearted and clear-headed evaluators of available evidence who are searching for profit opportunities. In this world of rational expectations, investment does not play an active role in business fluctuations, but a passive one. Investment changes when conditions, such as demand for products or the availability of funds, changes.

Because expectations matter, adjustment of the entire economy to an autonomous change takes time. We have looked at a number of places in which lags occur in adjustment. Lags occur because it takes time to distinguish permanent changes from temporary changes. In a world of perfect information and perfect mobility, a world of no lags, there should be no recessions. Prices should adjust to any level of total demand to insure full output. This clearly does not happen in the real world. In the case of the Great Depression, real GNP did exceed its level of 1929 until 1939 (though it would have passed it in 1937 had not the recession of 1937-38 occurred). On the other hand, the dislocations caused by the sudden end of German hyperinflation in 1923 were remarkably small.

WE ARE NOT ALONE

What happens in one nation can affect economic activity in other nations. One can sometimes forget this in a nation which is as large and self-sufficient in many items as the United States. To help you remember that the rest of the world matters, this text has weaved discussion of international issues throughout the book.

The ways in which economic disturbances can be transmitted to other countries, and

whether they can be transmitted at all, depend on the way a nation sets up its international monetary arrangements. If it lets its exchange rate float, its monetary policy is enhanced and its fiscal policy is weakened relative to what happens with fixed exchange rates (without exchange rate controls).

German hyperinflation did not spill over into France or England. The residents of these countries were little affected by what was happening in Germany. Germany had a floating exchange rate, so as its domestic prices went up, the value of its currency in terms of the French franc and the British pound fell. This fall offset for the French and the British the price rise inside Germany. The British buyer of German wine saw little or no change in the price he had to pay.

In contrast, the United States was on the gold standard until 1933. As its price level dropped, its goods became cheaper relative to goods in foreign nations which were also on the gold standard. Since the price of the dollar could not rise, this deflation set into effect flows of gold across boundaries, and the logic of the system forced a deflation throughout the nations which were also on the gold standard. All countries which had fixed the value of their currencies in terms of gold experienced the depression at roughly the same time. For those not on gold, the effects were less severe and in some cases very minor. For countries which had fixed the value of their currencies in terms of silver, the depression began when the United States began to buy silver at a price above the market price, leading to an outflow of silver from these countries and a reduction of their price levels.

CONCLUDING NOTES

George Bernard Shaw wrote that if all economists were laid end to end, they would not reach a conclusion. Though there is a general perception that Shaw was right, and that economists disagree about everything, there are in fact substantial areas of agreement among economists. This chapter has provided some examples. However, there are no issues on which 100% of economists agree; there are fringe positions on all issues (as there are in physics, biology, geology, etc.). Usually fringe positions are crackpot ideas, but a few are not. They will become the conventional wisdom of the future.

Fields in which controlled experiments can be conducted have much less disagreement than fields in which controlled experiments cannot be conducted. There is a much larger body of physics or chemistry about which there is little or no disagreement than there is of economics. But the areas of agreement in fields such as history, psychology, sociology, and anthropology are not substantially larger than those in economics, and may be smaller. Economics studies very complex systems, systems which have interactions producing unexpected consequences to many actions. Economists are limited to using whatever data those systems provide, and often the data they do provide is difficult to measure. If economists could roll back history and rerun the 1930s (or any other decade) five or six times, changing each time just a few variables, the area of agreement among economists would grow considerably. But they cannot. Disagreement will never disappear in macroeconomics. But even if there are sizable areas of disagreement, large areas about which almost all economists agree can exist.

QUESTIONS

1. Suppose that the price of a German widget rose from 2 marks to 40 marks, and that initially a British pound bought 10 marks.

a. What would the British price of the widget have been initially?

b. How many marks must the pound buy at the end so that the British price of widgets would not change?

2. In 1929 real GNP was $203.6 billion (in 1958 prices) and velocity of money was 3.91. In 1933 real GNP had fallen to $141.5 billion and velocity was 2.86. What happened to the real money stock?